DOCUMENT RESUME

ED 419 930 CE 076 537

AUTHOR Duncan, Kevin

TITLE Introduction to Swine Production. Instructor Guide [and] Student Reference.
INSTITUTION Missouri Univ., Columbia. Instructional Materials Lab.
SPONS AGENCY Missouri State Dept. of Elementary and Secondary Education, Jefferson City. Div. of Vocational and Adult Education.
PUB DATE 1997-10-00
NOTE 113p.
AVAILABLE FROM Instructional Materials Laboratory, University of Missouri, 2316 Industrial Drive, Columbia, MO 65202; toll-free phone: 800-669-2465; http://iml.coe.missouri.edu (order no. 10-4401-I, instructor guide: $11.75; 10-4401-S, student reference: $2.50).
PUB TYPE Guides - Classroom - Learner (051) -- Guides - Classroom - Teacher (052)
EDRS PRICE EDRS Price MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Agricultural Production; *Animal Husbandry; Animals; Citations (References); Course Content; Instructional Materials; *Job Skills; Learning Activities; Lesson Plans; *Livestock; Meat Packing Industry; Postsecondary Education; Secondary Education; State Curriculum Guides; Teaching Guides
IDENTIFIERS *Hogs

ABSTRACT

This packet contains an instructor guide and student reference for a course in introduction to swine production. The curriculum contains the following seven lessons: (1) introduction to the swine industry; (2) breeds of swine; (3) principles of swine selection; (4) production systems; (5) herd health; (6) herd management; and (6) industry concerns. The instructor guide includes the following: objectives, competencies, motivational techniques, teaching procedures, other activities, activity sheets, transparency masters, evaluations, answers to evaluations and activity sheets, references and teaching aids, and materials and equipment lists. For ease of use, the guide includes competencies and objectives at the beginning of the guide as well as incorporated within each lesson. In addition, 23 references are listed. A competency profile is provided in the front of the guide for convenient recordkeeping. An appendix lists eight swine associations with addresses and telephone numbers for further information. The guide incorporates the needed components to aid agriculture teachers to implement Vocational Instructional Management System (VIMS), a framework to use in planning and organizing to ensure excellence in Missouri's vocational education system by focusing greater attention on the management of teaching and learning. The student reference contains information sheets and summaries for each of the lessons. (KC)

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Introduction to Swine Production
Instructor Guide
Student Reference

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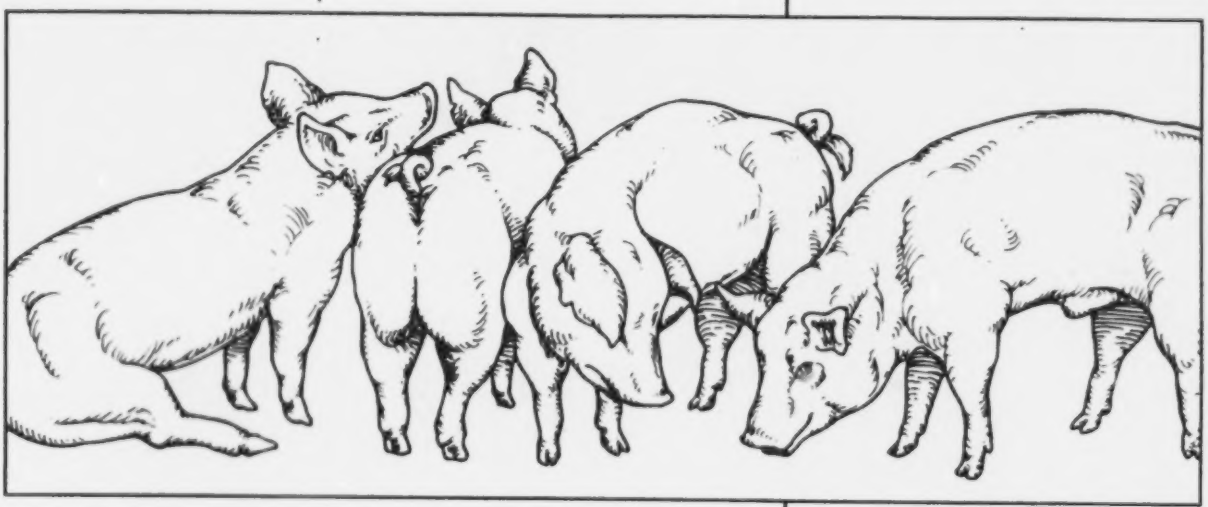
Introduction to

SWINE PRODUCTION

instructor guide



In cooperation with
Agricultural Education
Department of Practical Arts and Vocational-Technical Education
College of Education and College of Agriculture, Food and Natural Resources
University of Missouri-Columbia

In cooperation with
Agricultural Education Section
Division of Vocational and Adult Education
Elementary and Secondary Education
Jefferson City, Missouri

Instructional Materials Laboratory
University of Missouri-Columbia

Available from:
Instructional Materials Laboratory
University of Missouri-Columbia
10 London Hall
Columbia, MO 65211
573-882-2883

The activity that is the subject of this report was supported in whole or in part by funds from the Department of Elementary and Secondary Education, Division of Vocational and Adult Education. However, the opinions expressed herein do not necessarily reflect the position or policies of the Missouri Department of Elementary and Secondary Education or the Division of Vocational and Adult Education, and no official endorsement should be inferred.

Instructor Guide

INTRODUCTION TO SWINE PRODUCTION

Writer:
Kevin Duncan
Instructional Materials Laboratory
University of Missouri-Columbia

Consulting Editor:
Richard Linhardt
Agricultural Education
University of Missouri-Columbia

Sherry Mahnken, Assistant Editor
Instructional Materials Laboratory
University of Missouri-Columbia

Produced by:
Instructional Materials Laboratory
University of Missouri-Columbia
10 London Hall
Columbia, Missouri 65211

Volume 30
Number 1

Catalog Number 10-4401-I
October 1997

ACKNOWLEDGMENTS

Recognition is given to the following advisory committee members for providing their valuable time and suggestions in developing this *Introduction to Swine Production* curriculum. The committee consisted of Brock Bailey, Jim Bellis, Leigh Burkhalter, Mike Cloud, Shawn Coats, Keith Davis, Scott Hess, Tom Hulshof, Scott Long, Delbert Lund, Jim Spain, and Glen Waters.

Appreciation is expressed to the following staff members of the Instructional Materials Laboratory for their efforts in producing this material: Phyllis Miller, Interim Director; Dan Stapleton, Assistant Director; Eileen Woody, Assistant Director; Veronica Feilner, Senior Editor; Cheryl Unterschutz, Graphic Designer; Kevin Gamble, Graphic Artist; Jan Trimble, Word Processor; and Jill Clark and Shelly Seabaugh, Editorial Assistants.

Sherry Mahnken, Assistant Editor
Instructional Materials Laboratory
University of Missouri-Columbia

Richard Linhardt, Associate Professor
Agricultural Education
University of Missouri-Columbia

FOREWORD

The development of the *Introduction to Swine Production* curriculum guide is the result of suggestions by the MVATA Teaching Aids Committee. The Swine Production Advisory Committee suggested the topics to be included and reviewed the materials.

This curriculum contains seven lessons. The instructor's guide includes objectives, competencies, motivational techniques, teaching procedures, other activities, activity sheets, transparency masters, evaluations, answers to evaluations and activity sheets, references and teaching aids, and materials and equipment. Topics include an introduction to the swine industry, breeds of swine, principles of swine selection, production systems, herd health, herd management, and industry concerns. One copy of the student reference is packaged with the instructor's guide. Additional copies of the student reference can be purchased separately.

During the summer of 1981, the Missouri State Board of Education formally adopted the concept of "Instructional Management Systems" (IMS) as a priority for the 1981-82 school year. The Missouri Commissioner of Education described the IMS concept as a practical way of "organizing for excellence" in education. To meet the demand for greater productivity and accountability, the director of Vocational Education applied the elements of IMS to form the Vocational Instructional Management System (VIMS). The VIMS process provides a framework to use in planning and organizing to assure excellence in Missouri's vocational education system by focusing greater attention on the management of teaching and learning.

This guide incorporates the needed components to aid agriculture teachers in the implementation of VIMS. For ease of use, competencies/objectives have been included at the beginning of the guide as well as incorporated within each lesson. A competency profile has been provided in the front of the guide for convenient record keeping.

Richard Linhardt, Associate Professor
Agricultural Education
University of Missouri-Columbia

Terry Heiman, Director
Agricultural Education
Department of Elementary and
Secondary Education

INTRODUCTION TO SWINE PRODUCTION

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COMPETENCIES/OBJECTIVES

1. Describe the importance of the swine industry in Missouri and the United States.
2. Identify the major swine breeds and their significance in the industry.
3. Use available information to select swine.
4. Compare various production systems.

5. Develop a herd health program.

6. Identify management factors important to profitable hog production.

7. Assess issues concerning the swine industry.

EVALUATION

1. Give short, objective tests following each lesson and a more in-depth objective test at the conclusion of the unit.

2. Observe the changes in behavior as evidence of the improved ability of students to deal with problems in this unit using background information acquired from earlier units.

3. Observe students' attempts to solve similar problems in their supervised agricultural experience programs.

REFERENCES AND MATERIALS

1. Student Reference

   Introduction to Swine Production (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1997.

2. Teacher References

   a. Books

      1) *1996 Missouri Farm Facts.* Columbia: Missouri Agricultural Statistics Service in cooperation with the Missouri Department of Agriculture and the U.S. Department of Agriculture, 1996.

      2) Baker, Meelee, and Robert E. Mikesell. *Animal Science Biology and Technology.* Danville, Ill.: Interstate Publishers, Inc., 1996.

      3) Boggs, Donald L., and Robert A. Merkel. *Live Animal Carcass Evaluation and Selection Manual.* 4th ed. Dubuque: Kendall/Hunt Publishing Company, 1993.

      4) Ensminger, M. E. *Stockman's Handbook Digest.* Danville, Ill.: Interstate Publishers, Inc., 1992.

      5) Gillespie, James R. *Modern Livestock and Poultry Production.* 5th ed. Albany: Delmar, 1997.

      6) Lee, Jasper S., et al. *Introduction to Livestock and Poultry Production.* Danville, Ill.: Interstate Publishers, Inc., 1996.

      7) *Pork Issues Handbook.* Des Moines: National Pork Producers Council, 1996/1997.

      8) Taylor, Robert E., and Ralph Bogart. *Scientific Farm Animal Production.* 3rd ed. New York: Macmillan Publishing, 1988.

b. Pamphlets, magazines, etc.

1) *Guide to Environmental Quality in Pork Production.* Des Moines: National Pork Producers Council, 1993.

2) *Pork Quality Assurance Levels I, II, III.* Des Moines: National Pork Producers Council, 1994.

3) *Swine Care Handbook.* Des Moines: National Pork Producers Council, 1996.

c. Internet resources

1) Department of Animal Science, Oklahoma State University. "Breeds of Livestock." http://www.ansi.okstate.edu/breeds (30 September 1997).

2) Guthier, Harold D., and Janice Swanson. "Animal Rights and Animal Welfare." http://ianrwww.unl.edu/farmbill/aniright.htm (30 May 1997).

3) Harper, Allen F. "The Role of Swine Producer 'NETWORKS.'" gopher://gopher.ext.vt.edu:70/00/ .docs/aps/aps-628 (30 July 1997).

4) Lawrence, John D., et al. "Producing and Marketing Hogs Under Contract." http://www.public.iastate.edu/~pigmap/PIH/6.txt (30 July 1997).

5) National Pork Producers Council. "America's Pork Producers . . . 'Meeting Today's Environmental Challenges.'" http://www.nppc.org/environbook.html (30 May 1997).

6) National Pork Producers Council. "Most Commonly Asked Questions About Pork Production and the Environment." http://www.nppc.org/EnvironmentalSection/commquestions.html (30 May 1997).

7) National Pork Producers Council. "The Tradition of Care Continues on America's Hog Farms." http://www.nppc.org/how.hogs.are.raised.html (30 May 1997).

8) Nix, Jackie. "Facts about Contract Livestock Agriculture." http://duplin.ces.state.nc.us/pubs/contract.html (30 July 1997).

9) "What are EPDs?" http://www.ansc.purdue.edu/stages/stg_user.html#What are EPDs (2 June 1997).

d. Audiovisuals (available from the Missouri Vocational Resource Center, University of Missouri-Columbia, Columbia, MO 65211)

1) *Judging Market Swine.* Video. Vocational Education Productions, 1989.

2) *Swine Judging Practice Class.* Video. Vocational Education Productions, 1990.

3) *Practice Swine Judging.* Video. Creative Educational Video.

Introduction to Swine Production
Competency Profile

Directions: Evaluate the student by checking the appropriate number or letter to indicate the degree of competency. The rating for each task should reflect **employability readiness** rather than the grades given in class.

Rating Scale: **3 Mastered** - can work independently with no supervision
2 Requires Supervision - can perform job completely with limited supervision
1 Not Mastered - requires instruction and close supervision
N No Exposure - no experience or knowledge in this area

3	2	1	N

Introduction to Swine Production

1. Describe the importance of the swine industry in Missouri and the United States
2. Identify the major swine breeds and their significance in the industry
3. Use available information to select swine
4. Compare various production systems
5. Develop a herd health program
6. Identify management factors important to profitable hog production
7. Assess issues concerning the swine industry

Other:_____

_____

Introduction to Swine Production

Student Names														

Competencies

1. Describe the importance of the swine industry in Missouri and the United States.
2. Identify the major swine breeds and their significance in the industry.
3. Use available information to select swine.
4. Compare various production systems.
5. Develop a herd health program.
6. Identify management factors important to profitable hog production.
7. Assess issues concerning the swine industry.

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 1: Introduction to the Swine Industry

Competency/Objective: Describe the importance of the swine industry in Missouri and the United States.

Study Questions

1. **What are the economic implications of the swine industry?**
2. **What are commonly-used swine terms?**
3. **How has the swine industry evolved in the United States?**
4. **How do the production systems differ?**
5. **What are the business structures in the swine industry?**
6. **What career opportunities are available in the swine industry?**

References

1. *Introduction to Swine Production (Student Reference).* University of Missouri-Columbia: Instructional Materials Laboratory, 1997.
2. Activity Sheet
   a) AS 1.1: A Career in the Swine Industry

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 1: Introduction to the Swine Industry

TEACHING PROCEDURES

A. Introduction

The swine industry is one of the largest segments of American agriculture. More pork is consumed worldwide than any other protein source. This lesson will look at the economic importance of the swine industry, its production systems and business structures, and career opportunities available in the industry.

B. Motivation

Ask students approximately how many hogs are processed each year in the United States (96 million in 1995). Then ask them if they know how many are sold in their county.

C. Assignment

D. Supervised Study

E. Discussion

1. Begin the discussion of question 1 by emphasizing the size of the swine industry across the United States and in Missouri. Use the overhead or chalkboard to record statistics concerning the swine industry.

What are the economic implications of the swine industry?

a) In 1995, more than 96 million hogs were processed into over 17 billion pounds of pork.
b) Around 200,000 swine producers operate nationwide.
c) The industry generally ranks either fourth or fifth annually in terms of farm cash receipts.
d) More than $11 billion worth of hogs are sold each year, with a retail value of $30 billion.
e) In 1995, Missouri had approximately 5 percent of the hog operations nationwide.
f) The state ranked seventh in the number of hogs and pigs produced.
g) Mercer, Sullivan, and Putnam counties, which have close to one million head of hogs, are the top three Missouri counties.

2. Ask the class how many students have direct experience with swine. Discuss the terminology.

What are commonly used swine terms?

a) Farrow - to give birth
b) Gilt - young female that has not yet farrowed
c) Barrow - castrated male pig
d) Boar - male pig used for breeding
e) Sow - mature female hog
f) Feeder pig - gilt or barrow between weaning and finishing
g) Market hog - gilt or barrow weighing from 240 to 270 pounds and ready for processing

3. Ask the class if they think that more or fewer producers are involved in swine production today than 30 years ago. During the discussion, emphasize how the location of the industry and current focus of the swine industry are changing.

How has the swine industry evolved in the United States?

a) Fewer producers - currently 200,000, compared to three million 30 years ago
b) Larger farms - ranging in size from 1,000 to 80,000 sows
c) Changing location - from the Corn Belt to North Carolina, Arkansas, Texas, Kansas, and Oklahoma
d) Focus on expanding exports

4. Divide the board into three categories. Label them "Farrow-to-Finish Production," "Feeder Pig Production," and "Feeder Pig Finishing." Write the characteristics of each production system on the board in the appropriate category.

How do production systems differ?

a) Farrow-to-finish production
    1) This production system is the most common type of production; it involves the entire production process.
    2) Gilts and sows are mated to boars or artificially inseminated.
    3) Females farrow and are bred again when the piglets are weaned.
    4) Pigs are moved to a nursery until they weigh approximately 50 pounds.
    5) The pigs are then moved to finishing barns until they weigh 240 to 270 pounds, when they are sold as market hogs.
b) Feeder pig production
    1) This production system involves producing pigs to sell to other producers to be fed for market.
    2) Baby pigs are sold when they weigh approximately 50 pounds.
c) Feeder pig finishing
    1) Finishers purchase or receive pigs at approximately 50 pounds.
    2) They feed the pigs until they reach a market weight of 240 to 270 pounds.
    3) The pigs are then sold for processing.

5. Ask students what brand names or farm names they associate with the swine industry (e.g., Premium Standard Farms, Excel). Describe the influx of large corporations into the swine industry over the last several years. Focus on vertically integrated operations.

What are the business structures of the swine industry?

a) Privately owned family farms
b) Network production
    1) A group of producers cooperates to decrease production costs and improve profits for each operation.
    2) Networking can involve collective marketing arrangements, purchasing supplies at a discount for member operations, or cooperative production of swine.
c) Contract basis
    1) The individual producer signs a contract to produce pigs for a company.
    2) The company owns the pigs and finances the operation, and the producer provides the facilities, equipment, and labor.
    3) The company makes many of the management decisions.
    4) The producer is paid a fixed amount per animal.
d) Corporate farms
    1) The goal of large-scale corporate farms is efficient production of a uniform product.
    2) They may also be vertically-integrated; in vertical integration, the company owns and controls all phases of the production process.

6. Describe the diversity of the swine industry. List some of the careers on the overhead or board.

What career opportunities are available in the swine industry?

a) Producer
b) Breeding manager
c) Farrowing manager
d) Nursery manager
e) Feed mill technician
f) Artificial insemination technician
g) Animal geneticist
h) Animal health product sales representative
i) Veterinarian
j) Hog buyer
k) USDA inspector
l) Quality control supervisor

F. Other Activities

1. Obtain information from the Missouri Farm Facts manual about swine numbers in your community.

2. Compile a list of local businesses or careers directly related to swine production and the swine industry.

G. Conclusion

Receipts from swine production total more than $11 billion each year. The swine industry is evolving, with fewer producers and larger farms, changes in the location of swine production, a focus on increasing exports, and a growing interest in corporate hog production. Many career opportunities are available in this diverse industry.

H. Answers to Evaluation

1. c
2. d
3. d
4. a

5. Answers may include any three of the following: producer, breeding manager, farrowing manager, nursery manager, feed mill technician, artificial insemination technician, animal geneticist, animal health product sales representative, veterinarian, hog buyer, USDA inspector, or quality control supervisor.

6. A barrow is a castrated male, a boar is a male pig used for breeding, and a gilt is a young female who has not yet farrowed.

7. The individual producer signs a contract to produce pigs for a company. The company owns the pigs and finances the operation, and the producer provides the facilities, equipment, and labor. The company makes many of the management decisions. The producer is paid a fixed amount per animal.

8. Farrow-to-finish swine production is the most common type of production; it covers the entire production process. Gilts and sows are mated to boars. Females farrow and are bred again when the piglets are weaned. The baby pigs are moved into a nursery until they weigh approximately 50 pounds. They are then moved to finishing barns where they grow until they reach 240 to 270 pounds, when they are sold as market hogs.

UNIT - INTRODUCTION TO SWINE PRODUCTION Name _____

Lesson 1: Introduction to the Swine Industry Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. In 1995, how many market hogs were processed in the United States?

   a. 96 billion
   b. 96,000
   c. 96 million
   d. 960,000

2. In what type of business structure does a group of producers cooperate to decrease production costs and improve profits for each operation?

   a. Contract production
   b. Corporate production
   c. Vertically integrated production
   d. Network production

3. Currently, how many swine producers operate nationwide?

   a. 2 million
   b. 30 million
   c. 300,000
   d. 200,000

4. Where was most of the swine production in the United States located in the past?

   a. Midwest
   b. South
   c. West
   d. Northeast

Complete the following short answer questions.

5. What are three careers directly linked to the swine industry?

6. What is the difference between a barrow, boar, and gilt?

7. What is contract production of pigs?

8. What is farrow-to-finish production? Describe the production process.

Lesson 1: Introduction to the Swine Industry Name _____

A Career in the Swine Industry

Objective: Learn more about the swine industry by conducting an interview with someone in a related career.

Interview a person with a career in the swine industry. Record his or her name, occupation, and place of employment. Use the questions on this sheet as an aid when interviewing the individual. Write down the answers to questions, as well as any other information that is important. Then make a report about the career to the class.

Name:

Occupation:

Place of Employment:

How long have you worked in your present occupation?

Why did you choose this career?

What training was necessary for this career?

What skills do you use?

What previous jobs helped prepare you for this one?

What other jobs have you considered?

What are your career plans for the future?

What advice would you give someone who is considering a career in this area?

Comments:

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 2: Breeds of Swine

Competency/Objective: Identify the major swine breeds and their significance in the industry.

Study Questions

1. **What are the identifying characteristics and histories of the common swine breeds?**
2. **What are the determining factors that influence breed selection?**
3. **How are hybrid hogs developed?**
4. **How are inbreeding, outcrossing, and crossbreeding different?**

References

1. *Introduction to Swine Production (Student Reference).* University of Missouri-Columbia: Instructional Materials Laboratory, 1997.
2. Activity Sheets
   a) AS 2.1: Breeds of Hogs
   b) AS 2.2: Researching Swine Breeds

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 2: Breeds of Swine

TEACHING PROCEDURES

A. Review

Lesson 1 discussed the importance of the swine industry and the various types of production systems. Lesson 2 will focus on the major breeds of swine, along with breed selection and different types of breeding systems.

B. Motivation

Obtain a photograph of two white breeds of swine (Chester White, Yorkshire). Show the pictures to the class and ask them to identify the breeds. .

C. Assignment

D. Supervised Study

E. Discussion

1. Ask the class how many breeds of hogs they can name. Discuss the fact that there are relatively few breeds of swine compared to other animal species. Pass out AS 2.1 for students to complete. Discuss ear type and coloration, which are the major visible differences between breeds.

What are identifying characteristics and history of the common swine breeds?

a) Berkshire
   1) Black with six white points and erect ears
   2) Produce high quality meat
   3) Imported from England in the early 1800s

b) Chester White
   1) White with small drooping ears
   2) Once popular for their durability and ruggedness; also have good mothering ability
   3) Originated in Pennsylvania in the early 1800s

c) Duroc
   1) Red with drooping ears
   2) Used to produce fast-growing market hogs
   3) Developed in the United States in the mid-1800s by crossing red hogs from New York and New Jersey

d) Hampshire
   1) Black with a white belt around the front of the body and erect ears
   2) Used to produce lean, heavily muscled offspring
   3) Imported from England during the early 1800s

e) Landrace
   1) White with large, droopy ears that cover the entire face
   2) Used as a maternal breed because of their mothering ability
   3) Imported from Denmark in the 1930s

f) Pietrain
   1) Spotted with erect ears
   2) Leanest and most heavily muscled hogs; often carry a stress gene linked to meat quality problems
   3) Used to produce terminal sires

4) Imported from Germany and Poland

g) Poland China
   1) Black with six white points (like Berkshires) but with drooping ears
   2) Have been used to increase growth rates, but the breed's popularity has decreased because it has not kept up with the trend toward leanness
   3) Originated in Ohio in the first half of the nineteenth century

h) Spotted
   1) Black and white spots and drooping ears
   2) Have been used because of their rapid growth, but their numbers are small in comparison with other breeds used by the swine industry
   3) Originated in Indiana from the Poland China breed; purebred association formed in 1914

i) Yorkshire
   1) White with erect ears
   2) Used for mothering traits and for lean, heavily muscled, fast-growing market hogs
   3) Imported from England in the early 1800s

2. Ask students who raise swine for projects which breeds they prefer. If few or no swine producers are present, begin question 2 by reviewing the various types of production systems. Stress to students that most commercial producers use a variety of breeds.

What are the determining factors in breed selection?

a) Breeds used in the past
b) Litter sizes
c) Leanness
d) Muscle
e) Current growth rates
f) Efficiency in the conversion of feed to pork

3. Begin discussing question 3 by describing the trend in the swine industry toward larger operations. Larger operations demand consistent genetics. Discuss with the class that companies have genetically selected hogs to be used for specific purposes.

How are hybrid hogs developed?

a) Hybrid hogs are developed by crossing multiple breeds and selecting for desired traits.
b) Companies offer hybrid hogs varying in use from a maternal to a terminal emphasis.

4. Review the *Animal Reproduction* unit from IML and discuss the various types of breeding systems.

How are inbreeding, outcrossing, and crossbreeding different?

a) Inbreeding - mating two related animals in an attempt to concentrate desired traits in offspring
   1) Closebreeding - mating closely related animals
   2) Linebreeding - mating animals that are slightly or distantly related, with only one shared ancestor

b) Outcrossing - mating unrelated animals of the same breed; more popular and safer than inbreeding since inbreeding can concentrate undesirable and even detrimental traits

c) Crossbreeding - mating animals of two different breeds, which results in a hybrid offspring that should maximize heterosis, or hybrid vigor

F. Other Activities

Conduct more in-depth research on the history and development of breeds of swine used in the United States. Students can search the Internet for information on different breeds. Oklahoma State University has a website, located at http://www.ansi.okstate.edu/breeds, that discusses many breeds of livestock, including swine.

G. Conclusion

Several breeds may be used in swine production. Producers should select breeds that fit their needs and use them in a breeding program that will improve their herd.

H. Answers to Evaluation

1. i
2. c
3. e
4. f
5. d
6. d
7. c

8. Students may list any three of the following: breeds used in the past, litter sizes, leanness, muscle, current growth rates, or efficiency in the conversion of feed to pork.

9. Inbreeding is mating two related animals in an attempt to concentrate desired traits in offspring, while crossbreeding is mating animals of two different breeds, which results in a hybrid offspring that should maximize heterosis, or hybrid vigor.

10. Hybrid hogs are developed by crossing multiple breeds and selecting for desired traits.

UNIT - INTRODUCTION TO SWINE PRODUCTION Name _____

Lesson 2: Breeds of Swine Date _____

EVALUATION

Match the breed on the right with the best description on the left.

_____ 1.	Black with six white points and drooping ears	a.	Spotted
		b.	Berkshire
_____ 2.	Belted	c.	Hampshire
		d.	Duroc
_____ 3.	Leanest breed; used for terminal sires	e.	Pietrain
		f.	Yorkshire
_____ 4.	White with erect ears; maternal breed	g.	Landrace
		h.	Chester White
_____ 5.	Red; fast growing	i.	Poland China

Circle the letter that corresponds to the best answer.

6. Crossbreeding is an attempt to maximize:

   a. Uniformity.
   b. Color.
   c. Efficiency.
   d. Heterosis.

7. Which breeding system involves mating unrelated animals of the same breed?

   a. Crossbreeding
   b. Inbreeding
   c. Outcrossing
   d. Linebreeding

Complete the following short answer questions.

8. What are three factors that influence breed selection?

9. What is the difference between inbreeding and crossbreeding?

10. How are hybrid hogs developed?

Lesson 2: Breeds of Swine Name _____

Breeds of Hogs

Objective: Identify the distinguishing characteristics of major swine breeds.

Fill in the table with information about each breed of swine listed.

Breed Name	Color	Ear Type	Other Facts
Berkshire			
Chester White			
Duroc			
Hampshire			
Landrace			
Pietrain			

Breed Name	Color	Ear Type	Other Facts
Poland China			
Spotted			
Yorkshire			

Lesson 2: Breeds of Swine Name _____

Researching Swine Breeds

Objective: Become more familiar with the various breeds of swine.

Obtain the address of one of the major swine breed associations from your instructor. Write a letter to the association requesting information, pictures, videos, etc., for that breed.

When you receive the material from the breed association, prepare a report for the class. Your report should answer the following questions.

- What is the official name of the breed association?
- What is the history of the breed?
- When was the breed association formed?
- What are the standards for registration?
- What characteristics would disqualify an animal for registration?
- What are the important traits of the breed?

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 3: Principles of Swine Selection

Competency/Objective: Use available information to select swine.

Study Questions

1. **What are the parts of a hog?**
2. **What are the wholesale cuts of a hog?**
3. **What criteria are used in the selection of slaughter and feeder hogs?**
4. **What criteria are used in the selection of breeding hogs?**

References

1. *Introduction to Swine Production (Student Reference).* University of Missouri-Columbia: Instructional Materials Laboratory, 1997.
2. Transparency Masters
   a) TM 3.1a: Parts of a Hog
   b) TM 3.1b: Parts of a Hog (Overlay)
   c) TM 3.2: Wholesale Cuts of Pork
   d) TM 3.3: Leanness in Pork
   e) TM 3.4: Leg Structure
   f) TM 3.5: Swine Ratios
3. Activity Sheet
   a) AS 3.1: Parts of a Hog

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 3: Principles of Swine Selection

TEACHING PROCEDURES

A. Review

Lesson 2 discussed the major swine breeds, how to select a breed or hybrid, and breeding systems. This lesson will look at the parts of the pig and the wholesale cuts of pork. It will focus on the selection of slaughter, feeder, and breeding swine for production.

B. Motivation

Obtain a photograph of a high quality market hog, gilt, or boar, and compare it to a photograph of a poor quality pig. Discuss the differences between the animals.

C. Assignment

D. Supervised Study

E. Discussion

1. Begin the discussion by pointing out that the swine industry has a unique language for describing the parts of a pig. Have students complete AS 3.1. Use TM 3.1a and 3.1b to illustrate the different parts.

What are the parts of a hog?

a) Snout
b) Cheek
c) Jowl
d) Eye
e) Ear
f) Poll
g) Neck
h) Shoulder
i) Back
j) Loin
k) Rump
l) Tail
m) Ham
n) Hind leg
o) Hock
p) Hind flank
q) Toe
r) Belly
s) Side
t) Foreflank
u) Foreleg
v) Dewclaw
w) Pastern

2. Describe what a wholesale cut is. Use TM 3.2 to illustrate the wholesale cuts of pork.

What are the wholesale cuts of a hog?

a) Shoulder butt
b) Picnic shoulder
c) Loin
d) Side
e) Leg

3. Ask students what traits a high quality slaughter hog has. Describe the swine industry's push for leaner pork because of consumer demands. Use TM 3.3 to show leanness in a market hog.

What criteria are used in selection of slaughter and feeder hogs?

a) Slaughter hogs
   1) Leanness - must be mostly fat free to produce lean pork; should have an hourglass shape and be trim through the lower body
   2) Muscle - should be heavily muscled, with good muscle expression
   3) Size/age - should reach a market weight of 240 to 270 pounds, at an age of 140 to 170 days
   4) Soundness - should have good feet and legs and be able to get up and down and move with relative ease

b) Feeder pigs
   1) Health - should be purchased from healthy herds and vaccinated against the major swine diseases
   2) Soundness - must be able to move with ease
   3) Lean/muscle - should be extremely lean and show muscle expression at 50 pounds to maintain leanness until market weight
   4) Frame size - should be large framed because large-framed animals mature later and stay leaner at higher weights

4. Ask the class what factors are used in selecting breeding hogs. Point out that the ultimate purpose of breeding animals is to produce lean, high quality pork. TM 3.4 shows the differences in skeletal soundness. Use TM 3.5 to aid in further explaining SPI, TSI, and MLI.

What criteria are used in the selection of breeding hogs?

a) Visual
   1) Reproductive soundness - a priority in selection; requires two functional testicles in boars and a fully developed vulva and a minimum of six and preferably seven teats per side in females
   2) Skeletal soundness - another priority; must have proper skeletal angulation and move with ease to survive, grow, and reproduce in confinement on concrete floors
   3) Growth/production - should be fast growing, based on the age of the animal at 230 pounds; should also come from large litters and have a large body capacity
   4) Frame size - should be large framed to produce lean animals at high weights
   5) Leanness/muscling - should be leaner and more muscular than average, with an adjusted backfat scan at 240 pounds between .6 and 1.1 inches and a loin eye area of more than six square inches

b) EPD information for SPI, MLI, TSI - All three indexes assign an average parent a specific value, while a higher value indicates a superior animal.
   1) Sow Productivity Index (SPI) - looks at EPDs for 21-day litter weight and number born alive; used when selecting animals for these reproductive traits
   2) Terminal Sire Index (TSI) - looks at EPDs for the number of days to 230 and for backfat; used to select terminal sires
   3) Maternal Line Index (MLI) - looks at EPDs for both reproductive traits (21-day litter weight, number born alive) and growth data (days to 230, backfat); used to select replacement gilts

F. Other Activities

1. Show a video on swine selection/evaluation such as *Judging Market Swine*, available from MVRC.

2. Obtain two market hogs to use in a live evaluation exercise. One animal should be lean and muscular, while the other should be fatter and more lightly muscled. Have the students evaluate the hogs for leanness and muscle. If possible, send the hogs to the local locker plant and measure backfat and loin eye area. Discuss the results with the class.

G. Conclusion

Everyone involved in the swine industry should be familiar with the parts and wholesale cuts of a hog. Slaughter and feeder pig selection focuses on lean and muscular animals that can grow quickly and efficiently. Breeding hogs must be reproductively and skeletally sound and able to produce lean, muscular, and fast-growing offspring. Producers can also use the Sow Productivity Index, Terminal Sire Index, and Maternal Line Index to select breeding animals.

H. Answers to Activity Sheet

AS 3.1

1. Ear
2. Eye
3. Cheek
4. Snout
5. Jowl
6. Pastern
7. Dewclaw
8. Foreleg
9. Foreflank
10. Belly
11. Side
12. Toe
13. Hind flank
14. Hock
15. Hind leg
16. Ham
17. Tail
18. Rump
19. Loin
20. Back
21. Shoulder
22. Neck
23. Poll

I. Answers to Evaluation

1. d
2. h
3. g
4. j
5. b
6. c
7. f
8. a
9. i
10. e
11. b
12. d
13. c

14. Breeding animals must have proper skeletal angulation and move with ease to survive, grow, and reproduce in confinement on concrete floors.

15. Feeder pigs should be large framed because large-framed animals mature later and stay leaner at higher weights.

16. Loin, side, leg, shoulder butt, picnic shoulder

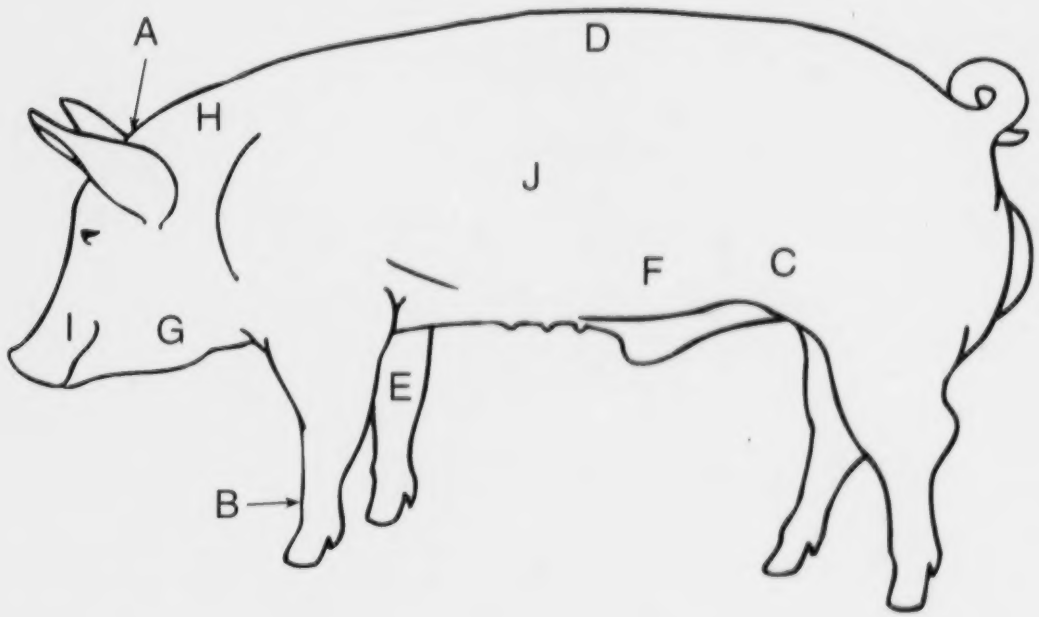
17. The TSI looks at EPDs for the number of days to 230 and for backfat, while the MLI looks at EPDs for both reproductive traits (21-day litter weight, number born alive) and growth data (days to 230, backfat). The TSI is used to select terminal sires, and the MLI is used to select replacement gilts.

UNIT - INTRODUCTION TO SWINE PRODUCTION Name _____

Lesson 3: Principles of Swine Selection Date _____

EVALUATION

Write the letter from the diagram in the blank next to the name of that part of the pig.



1. _____ Loin
2. _____ Neck
3. _____ Jowl
4. _____ Side
5. _____ Pastern
6. _____ Hind flank
7. _____ Belly
8. _____ Poll
9. _____ Cheek
10. _____ Foreleg

Circle the letter that corresponds to the best answer.

11. Typically, how old is a market hog when it reaches 240 to 270 pounds?

    a. 110 to 140 days
    b. 140 to 170 days
    c. 190 to 220 days
    d. Over one year

12. What does SPI mean?

a. Special Pork Index
b. Swine Production Index
c. Size/Productivity Index
d. Sow Productivity Index

13. What shape does a lean hog have when viewed from the top?

a. Circle
b. Rectangle
c. Hourglass
d. Oval

Complete the following short answer questions.

14. Why is skeletal soundness important in breeding hog selection?

15. Why should feeder pigs have a large frame?

16. What are the five wholesale cuts of pork?

a.

b.

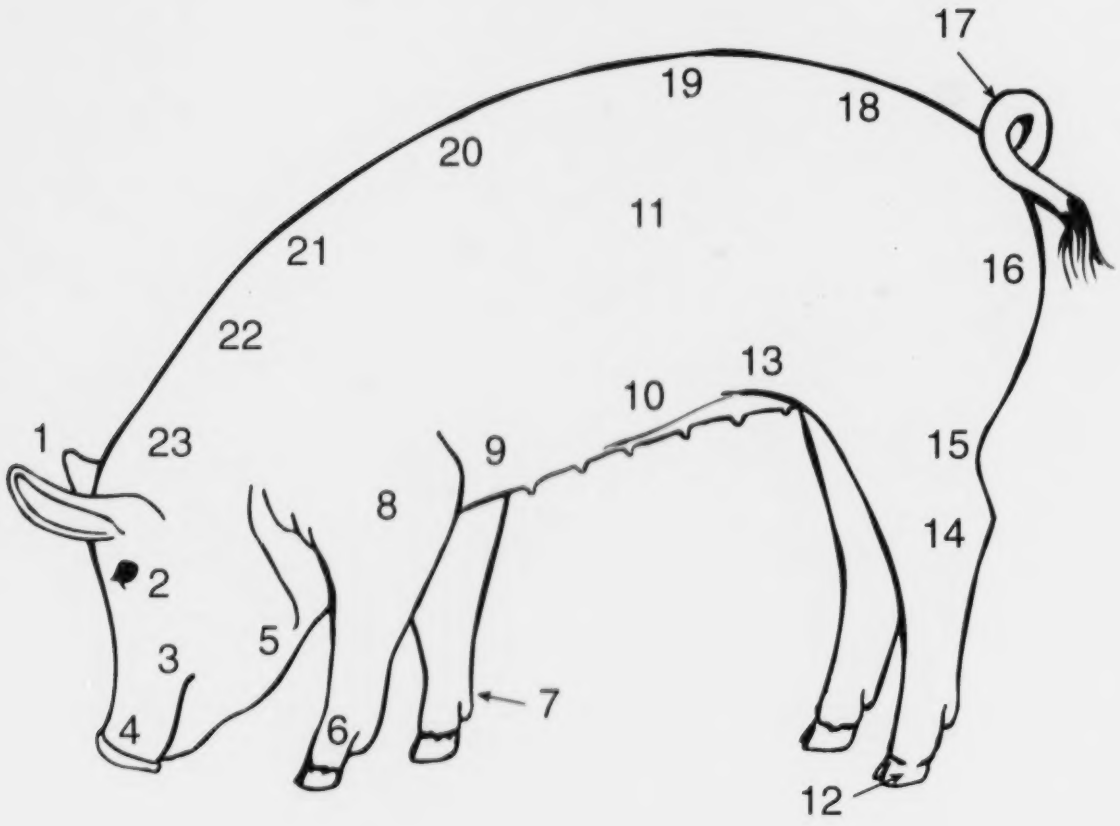
c.

d.

e.

17. What is the difference between TSI and MLI? For what should each be used?

Parts of a Hog

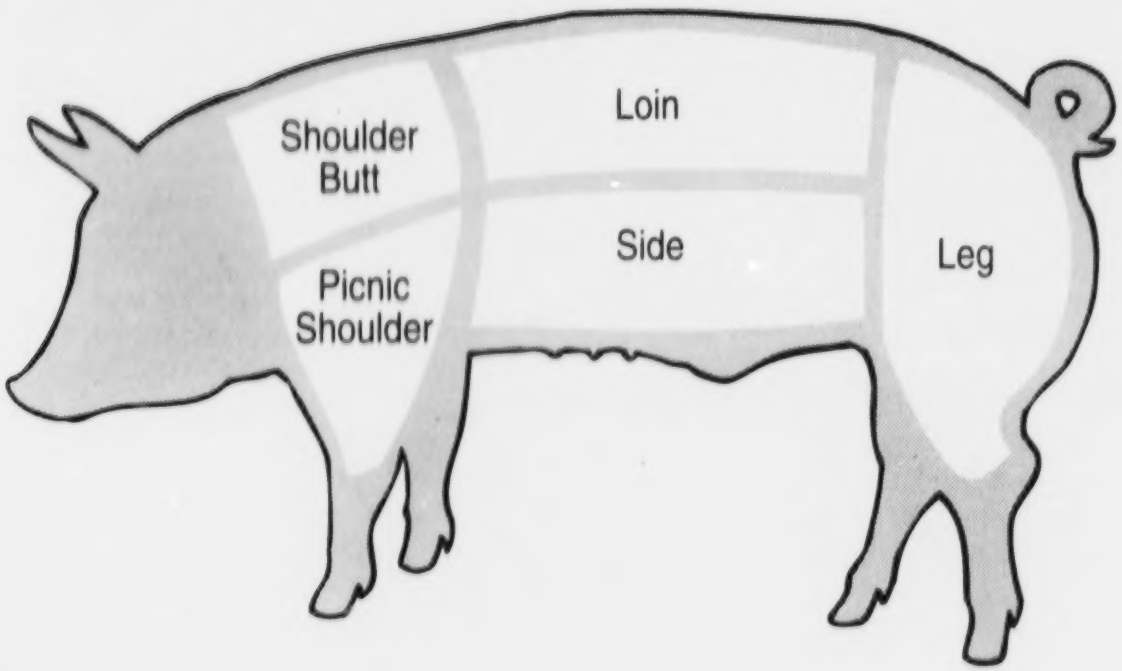


TM 3.1a

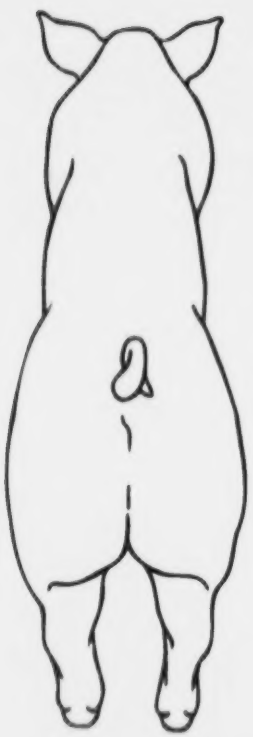
Parts of a Hog (Overlay)

TM 3.1b

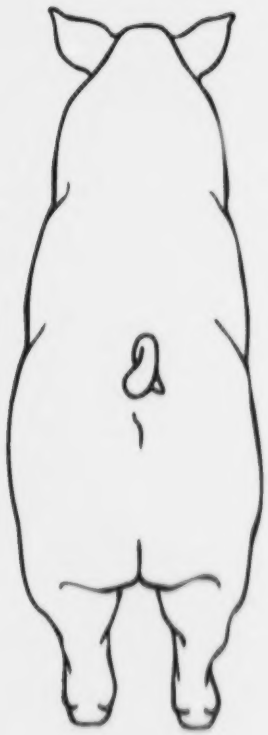
Wholesale Cuts of Pork



Leanness in Pork



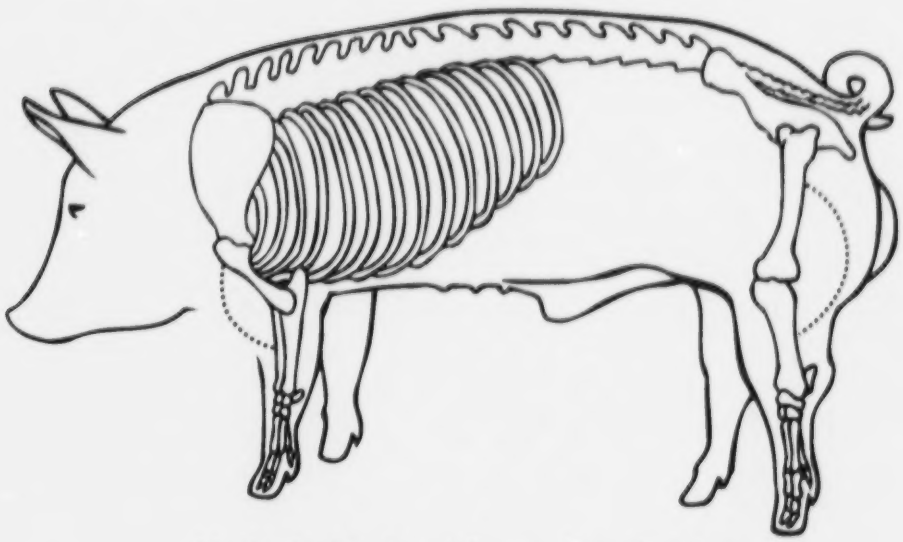
Lean



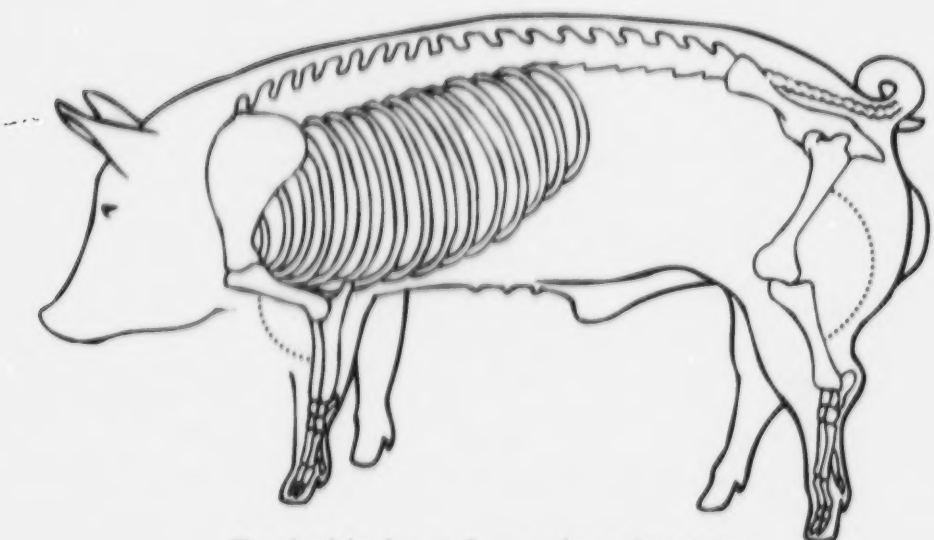
Fat

TM 3.3

Leg Structure



Undesirable front & rear leg structure



Desirable front & rear leg structure

Swine Ratios

Values:

100 = Average
>100 = More productive than average
<100 = Less productive than average

Sow Productivity Index (SPI):

- 21-day litter weight
- Number born alive

Terminal Sire Index (TSI):

- Days to 230
- Backfat

Maternal Line Index (MLI):

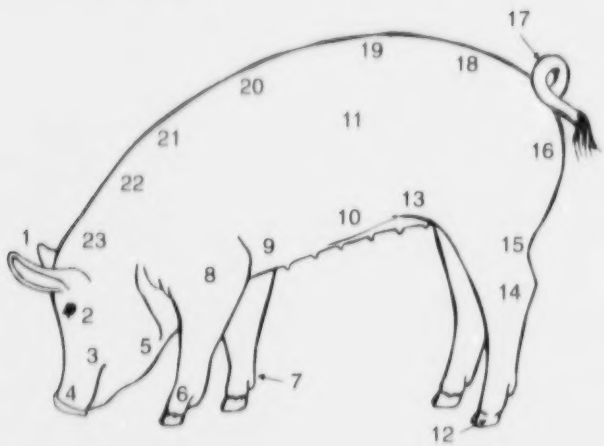
- 21-day litter weight
- Number born alive
- Days to 230
- Backfat

Lesson 3: Principles of Swine Selection Name _____

Parts of a Hog

Objective: Identify the parts of a pig.

Label the parts of a hog on the drawing below.



1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____
23. _____

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 4: Production Systems

Competency/Objective: Compare various production systems.

Study Questions

1. **What are the facility requirements for the different production systems?**
2. **How do production costs differ for each system?**
3. **How do the potential returns differ for each system?**
4. **What are the marketing options for various production systems?**

References

1. *Introduction to Swine Production (Student Reference).* University of Missouri-Columbia: Instructional Materials Laboratory, 1997.
2. Activity Sheet
   a) AS 4.1: Feeder Pig Budget

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 4: Production Systems

TEACHING PROCEDURES

A. Review

Lesson 3 focused on the selection of slaughter, feeder, and breeding hogs. Students should be aware that the choices made when selecting animals will directly affect the success and profitability of a swine operation. Lesson 4 will look at the facilities required, costs, returns, and marketing options for the three production systems.

B. Motivation

Ask the class how many of them are willing to take out a loan for hundreds of thousands of dollars to be involved in agriculture. Discuss the costs associated with swine production, particularly for facilities.

C. Assignment

D. Supervised Study

E. Discussion

1. Ask students about the types of swine facilities with which they are familiar. Write their responses on the board or overhead. Discuss the change to large total confinement operations in swine production. Have students complete AS 4.1.

What are the facility requirements for the different production systems?

a) Farrow-to-finish production
   1) Farrowing house
   2) Nursery
   3) Growing/finishing barns
   4) Gestation/breeding barns
   5) Feed handling and storage
   6) Manure storage

b) Feeder pig production
   1) Farrowing house
   2) Nursery
   3) Gestation/breeding barn
   4) Feed handling and storage
   5) Manure storage

c) Feeder pig finishing
   1) Growing/finishing barns
   2) Feed handling and storage
   3) Manure storage

2. Ask students what costs a producer would incur in producing hogs. List the answers on the board and discuss them in connection to the different production systems. Explain the large investment required to build a 300-sow facility.

How do production costs differ for each system?

a) Producers will have two types of costs: fixed and variable costs.

1) Fixed - similar for all producers despite the type of production system used
   (a) Depreciation
   (b) Interest on loans
   (c) Repairs
   (d) Taxes
   (e) Insurance
2) Variable - differ depending on the production system
   (a) Feed - major variable cost in raising swine
   (b) Medications
   (c) Veterinary care
   (d) Equipment
   (e) Facilities
   (f) Cost of the stock

b) Costs for the various production systems differ.
   1) Farrow-to-finish production - has the most costs because producers own the animals for the longest time; must purchase breeding stock and maintain a breeding herd as well as raise market hogs
   2) Feeder pig production - has costs similar to farrow-to-finish production, but producers do not have to pay for the feed and facilities needed to finish slaughter hogs for market
   3) Feeder pig finishing - has the fewest costs, since producers do not have the expenses connected to breeding and raising young pigs

3. Begin the discussion of question 3 by asking students how various types of swine production generate returns. Write the answers on the board. Discuss the variability of hog prices throughout the year.

How do potential returns on production differ for each production system?

a) Farrow-to-finish production
   1) Returns come from the sale of slaughter hogs.
   2) Market hogs typically weigh 240 to 270 pounds and have an average price of $40 to $60 per cwt.

b) Feeder pig production
   1) Income is derived from selling feeder pigs.
   2) Prices generally range from $30 to $55, with an average of $45.

c) Feeder pig finishing
   1) Returns come from the sale of slaughter hogs.
   2) While they may receive the same amount of money as farrow-to-finish producers, feeder pig finishers must pay for the feeder pigs.

4. Begin question 4 by asking the class where producers could sell hogs. Write their responses on the board. Ask students about local markets close to or in the community. Describe the differences between the various marketing options.

What are the marketing options for various production systems?

a) Farrow-to-finish/feeder pig finishers
   1) Buying stations
      (a) They are owned and operated by packers.
      (b) They purchase hogs at a set price, which is generally based on the lean yield from the last three loads sold by the producer.
      (c) Producers deliver the hogs to the local station or send them directly to the processing plant.
   2) Auction markets
      (a) They sell market hogs to the highest bidder.

(b) They are usually privately owned.
(c) The owner charges the producer a fee.

3) Network marketing - Independent producers cooperate to ship their hogs together to market a larger number of animals and get a better price for their hogs

4) Lean-based systems
   (a) Producers send hogs directly to packing plant to be processed.
   (b) Carcasses are measured for backfat and muscling.
   (c) Measurements are put into a formula that calculates the percentage of muscle containing 5 percent fat.
   (d) The packing plant pays a premium for hogs with more than 49 percent muscle, while hogs with a lower percentage are penalized in price.

5) Niche markets
   (a) In value-added marketing, a pork producer might sell the actual food product to consumers or food distributors.
   (b) Producers may cooperate with meat processors or packing houses in value-added ventures; the producer pays the processor for slaughtering the hogs and processing the meat and then sells the meat.
   (c) Some producers may have their own slaughtering and processing facilities.
   (d) Producers hope to take a larger share of the profits along the food distribution channel.

b) Feeder pig producers - They have a contract with a company or with individual feeder pig finishers that states the purchase price for each pig produced to the specified weight and/or age.

F. Other Activities

Prepare a detailed map showing the facilities required for a total confinement swine operation with 300 sows.

G. Conclusion

The three swine production systems differ in the facilities required, costs, and potential returns. Producers must try to reduce costs and maximize returns to make a profit. Returns vary depending on production levels and market prices. The markets available to farrow-to-finish producers and feeder pig finishers are buying stations, auctions, network marketing, lean-based systems, and niche markets.

H. Answers to Activity Sheet

AS 4.1

Costs:

Stock: 50 pigs × 50 pounds per pig × $.90 per pound = $2,250
Vaccinations: $2 per pig × 50 pigs = $100
Feed : 250 pounds (market weight) - 50 pounds (starting weight) = 200 pounds
200 pounds × 3 pounds (feed to gain) = 600 pounds of feed per pig
600 pounds of feed per pig × $14 per cwt × 50 pigs = $4,200 (600 x .14 x 50)
Total cost: $2,250 + $100 + $4,200 = $6,550

Returns:

$52 ÷ 100 pounds = $.52 per pound
50 pigs × 250 pounds per pig × $.52 per pound = $6,500

Recommended action:

No, I will not purchase the pigs, because it is not profitable.

I. Answers to Evaluation

1. c
2. d
3. b
4. a

5. Farrowing house, nursery, growing/finishing barns, gestation/breeding barns, feed handling and storage, and manure storage

6. In auction markets, hogs are sold to the highest bidder, while they are purchased at a set price at buying stations.

7. Farrow-to-finish producers have the most costs because they own the animals for the longest time. They must purchase breeding stock and maintain a breeding herd as well as raise market hogs.

8. While they have the same potential return on a market hog as farrow-to-finish producers, feeder pig finishers must pay to purchase feeder pigs out of the returns.

UNIT - INTRODUCTION TO SWINE PRODUCTION Name _____

Lesson 4: Production Systems Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. Which type of producer requires the fewest facilities?

   a. Farrow-to-finish producers
   b. Feeder pig producers
   c. Feeder pig finishers
   d. Corporate producers

2. Which of the following marketing options allows a producer to take a larger share of the profits along the food distribution channel?

   a. Buying stations
   b. Auction markets
   c. Lean-based systems
   d. Value-added marketing

3. What is the major production cost of raising hogs?

   a. Vaccines
   b. Feed
   c. Equipment
   d. Facilities

4. Which marketing option involves very specific calculations of the hog's percentage of muscle?

   a. Lean-based marketing
   b. Auctions
   c. Buying stations
   d. Direct sales to retailers

Complete the following short answer questions.

5. What facilities does a farrow-to-finish producer need?

6. How do auction markets and buying stations differ in the price paid to producers?

7. Which of the production systems has the most costs? Why?

8. How do feeder pig finishing and farrow-to-finish production differ in potential returns?

Lesson 4: Production Systems Name _____

Feeder Pig Budget

Objective: Plan a budget taking into account costs and potential returns.

You are considering raising feeder pigs as an FFA SAE project. Your father has a concrete pen with a small shelter capable of holding fifty 250-pound pigs. You can borrow a self feeder and waterer from your neighbor for your first set of pigs. Your neighbor is also willing to sell you fifty feeder pigs weighing 50 pounds for $.90 per pound. You expect to purchase complete swine feed for $14.00 per 100 pounds; the feed to gain ratio of the pigs will be 3:1 (which means that the pig will eat three pounds of feed for each pound it gains). The local veterinarian recommends vaccinating the pigs for health reasons, which will cost $2 per pig. The futures market quotes market hog prices at $52 per cwt.

Put together a budget showing costs, total cost, and returns. Show your calculations. Then circle the statement that reflects the recommended action based on the planned budget.

Costs

Returns

Recommended action:

Yes, I will purchase the pigs.

No, I will not purchase the pigs, because it is not profitable.

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 5: Herd Health

Competency/Objective: Develop a herd health program.

Study Questions

1. **What are the swine diseases?**
2. **What techniques can be used to reduce the spread of disease?**
3. **What type of herd health program is used for each production system?**
4. **What are the proper techniques for administration of medications?**

References

1. *Introduction to Swine Production (Student Reference).* University of Missouri-Columbia: Instructional Materials Laboratory, 1997.
2. Transparency Master
   a) TM 5.1: Injection Sites
3. Activity Sheets
   a) AS 5.1: Swine Diseases
   b) AS 5.2: Swine Antibiotics

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 5: Herd Health

TEACHING PROCEDURES

A. Review

Lesson 4 discussed the facilities, costs, returns, and marketing options of the various production systems. This lesson will focus on diseases and the herd health procedures used by swine producers.

B. Motivation

Describe the effects a serious outbreak of disease can have on a swine herd (e.g., PRRS can cause 50 to 100 percent of gestating sows and gilts to abort).

C. Assignment

D. Supervised Study

E. Discussion

1. Have the class list the major swine diseases. Next, ask students if the diseases can be controlled. Have students complete AS 5.1.

What are the swine diseases?

a) Erysipelas
   1) Symptoms - slow growth, lameness, red skin lesions
   2) Prevention - vaccinations at six to eight weeks of age

b) Leptospirosis
   1) Symptoms - abortions, birth of weak or dead pigs
   2) Prevention - vaccinations for males and females, with females vaccinated two to three weeks before breeding

c) Pneumonia
   1) Symptoms - chronic coughing, reduction in growth and efficiency
   2) Prevention - vaccinations for some strains, as well as good management, including good sanitation, isolation of infected animals, and avoiding exposure to cool and drafty conditions

d) Porcine reproductive and respiratory syndrome (PRRS) - most profound health problem in swine herds
   1) Symptoms - abortions, mummified pigs, stillbirths, chronic respiratory problems
   2) Prevention - vaccinations, buying breeding stock free of the disease

e) Pseudorabies
   1) Symptoms - high death rate in young pigs, paralysis, fever, abortions, stillbirths
   2) Prevention - purchase of breeding stock from disease-free herds, vaccinations

f) Rhinitis
   1) Symptoms - twisted snout from degeneration of the bones
   2) Prevention - vaccinations of sows and baby pigs

g) Transmissible gastroenteritis (TGE)
   1) Symptoms - diarrhea, death rate close to 100 percent in young pigs
   2) Prevention - vaccinations, proper sanitation

2. Ask students what techniques swine producers can use to help reduce the spread of disease. Write their responses on the board. Discuss each method in detail with the class.

What techniques can be used to reduce the spread of disease?

a) Biosecurity - preventive measures designed to reduce exposure to disease by isolating diseased animals, keeping them from contaminating others
   1) Operations limit the number of outside visitors.
   2) Visitors must shower in and put on clean clothes and shoes before entering the facilities.
   3) Access to critical areas like the farrowing house and nursery is limited.
   4) Certain people can only enter particular buildings.

b) Proper sanitation
   1) Animals entering the facilities are cleaned and washed.
   2) Buildings are cleaned and disinfected after the pigs are moved out of them.

c) Purchase and use of disease-free breeding stock
   1) Only disease-free breeding stock from producers with strict health programs should be used; their herds may be validated as specific pathogen free (SPF) herds.
   2) Blood tests are done before sale to check for disease.
   3) All incoming breeding stock should go through an isolation and acclimation period lasting 45 to 60 days in which they are tested for diseases and exposed to cull animals from the facility.
   4) Using artificial insemination can reduce the spread of disease.

3. Ask students what types of herd health programs are used in swine production. Point out that every producer has different health challenges. He or she should design a health program to fit his or her needs.

What type of herd health program is used for each production system?

a) Farrow-to-finish producers - Involved in all phases of production; have the most extensive herd health program because they must prevent health problems in the breeding, farrowing, and growth phases
   1) Use blood tests to reveal health problems, and target those problems with vaccines.
   2) Buy disease-free breeding stock.
   3) Practice biosecurity.
   4) Administer preventive antibiotics in feed.
   5) Control external and internal parasites.

b) Feeder pig producers
   1) Purchase disease-free breeding stock.
   2) Practice biosecurity.
   3) Take blood samples to reveal health problems, and vaccinate against them.
   4) Use preventive antibiotics in feed.
   5) Control external and internal parasites.

c) Feeder pig finishers - Typically have the fewest problems with disease since they own the pigs for a short time, with no breeding, gestation, or farrowing.
   1) Purchase vaccinated feeder pigs.
   2) Use antibiotics in the pigs' feed.
   3) Practice biosecurity measures.
   4) Treat animals for parasites.

4. Ask students how medications and vaccines are administered to hogs. Write the three main methods on the board or overhead. Use TM 5.1 to help illustrate proper injection sites. Have students complete AS 5.2.

What are the proper techniques for administration of medications?

a) Subcutaneous injections (Sub-Q)

1) Given between the skin and muscle
2) Given behind the front leg in the loose skin of the foreflank
3) Recommended because of the potential for carcass damage when injections are made into muscle tissue

b) Intramuscular injections (IM)
1) Made into the muscle
2) Always given in the neck and never in the rump or ham because the meat from the neck area is of a lower value

c) Medicated feed - Contains small amounts of USDA-approved antibiotics that the pig consumes as it feeds; prevents disease and promotes growth

F. Other Activities

1. Have a local veterinarian visit the class, or take a field trip to a veterinary clinic for a discussion of swine herd health programs.

2. Have students research a swine disease in more detail and report on it to the class.

G. Conclusion

Herd health and disease prevention are major concerns of swine producers. Several diseases can affect the swine herd. Biosecurity is an inexpensive method of preventing these diseases from spreading through a herd. Other ways to control the spread of disease are through proper sanitation and the use of disease-free breeding stock. A herd health program should include blood tests to reveal health problems; the results of the tests form the basis of a proper vaccination program. Subcutaneous injections should be used whenever possible.

H. Answers to Activity Sheet

AS 5.1

Disease	Symptoms	Prevention
Erysipelas	slow growth, lameness, skin lesions	vaccinations at six to eight weeks of age
Leptospirosis	abortions, birth of weak or dead pigs	vaccinations for males and females, with females vaccinated two to three weeks before breeding
Pneumonia	chronic coughing, reduction in growth and efficiency	vaccinations for some strains; good management practices, including good sanitation, isolation of infected animals, and avoiding exposure to cool and drafty conditions
Porcine reproductive and respiratory syndrome (PRRS)	abortions, mummified pigs, stillbirths, chronic respiratory problems	vaccinations; buying breeding stock free of the disease
Pseudorabies	high death rate in young pigs, paralysis, fever, abortions, stillbirths	purchase of breeding stock from disease-free herds; vaccinations
Rhinitis	twisted snout from degeneration of bones	vaccinations of sows and baby pigs
Transmissible gastroenteritis (TGE)	diarrhea, death rate close to 100 percent in young pigs	vaccinations; proper sanitation

AS 5.2

Answers will vary.

I. Answers to Evaluation

1. a
2. c
3. b
4. d
5. d

6. These measures are designed to reduce exposure to disease by isolating diseased animals, keeping them from contaminating others.

7. Subcutaneous injections are recommended because of the potential for carcass damage when injections are made into muscle tissue.

8. Students may list any two of the following: purchasing disease-free breeding stock, practicing biosecurity, taking blood samples to reveal health problems and vaccinating against them, using preventive antibiotics in feed, and controlling external and internal parasites.

UNIT - INTRODUCTION TO SWINE PRODUCTION Name _____

Lesson 5: Herd Health Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. Skin lesions are a symptom of which of the following diseases?

   a. Erysipelas
   b. Pneumonia
   c. TGE
   d. Rhinitis

2. Which of the following is not an aspect of biosecurity?

   a. Operations limit the number of outside visitors.
   b. Access to critical areas like the farrowing house and nursery is limited.
   c. Buildings are cleaned and disinfected after pigs are moved out of them.
   d. Certain people can only enter particular buildings.

3. Which of the following production systems has the most extensive herd health program?

   a. Feeder pig producers
   b. Farrow-to-finish producers
   c. Feeder pig finishers
   d. Contract finishers

4. What is the most profound health problem in swine herds?

   a. Erysipelas
   b. Leptospirosis
   c. Pseudorabies
   d. PRRS

5. What disease results in the degeneration of the bones of the pig's snout?

   a. PRRS
   b. Pneumonia
   c. TGE
   d. Rhinitis

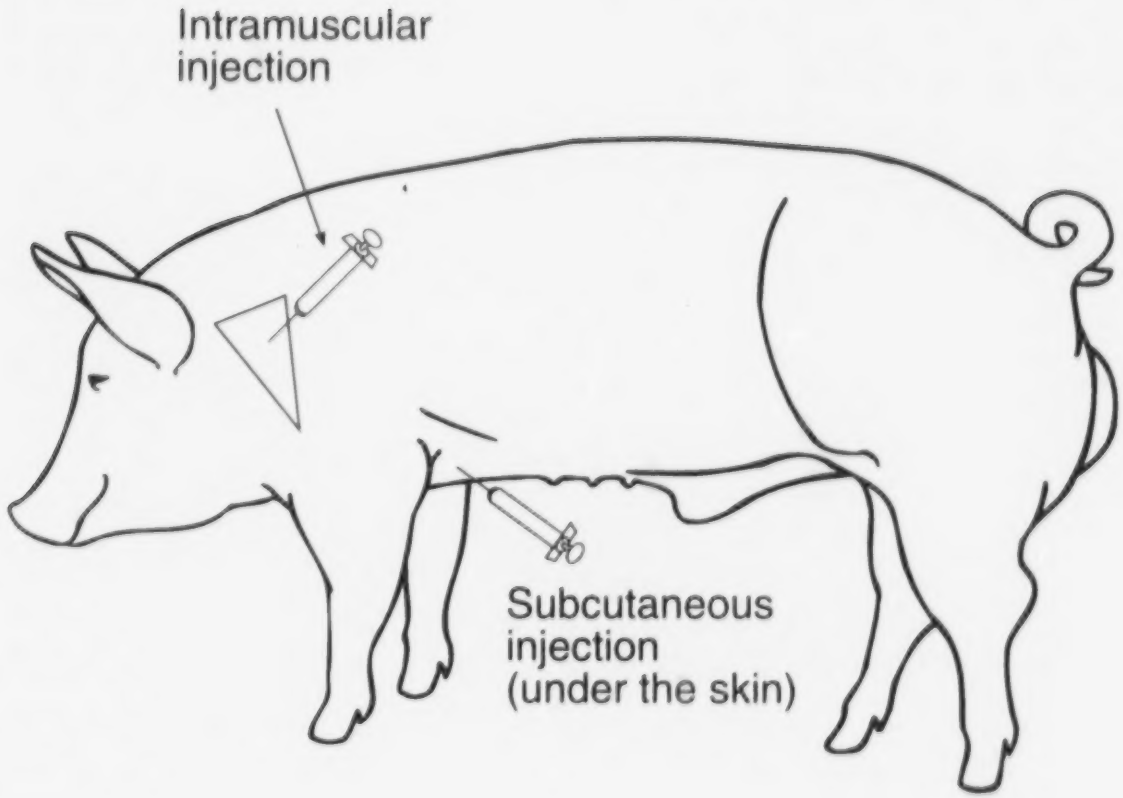
Complete the following short answer questions.

6. What is the purpose of biosecurity measures?

7. Which injection method is most recommended for swine? Why?

8. What are two aspects of a herd health program for feeder pig producers?

Injection Sites



TM 5.1

Lesson 5: Herd Health Name _____

Swine Diseases

Objective: Describe the major swine diseases.

Complete the table by listing the symptoms of the diseases and ways to prevent animals from getting them.

Disease	Symptoms	Prevention
Erysipelas		
Leptospirosis		
Pneumonia		
Porcine reproductive and respiratory syndrome (PRRS)		
Pseudorabies		
Rhinitis		
Transmissible gastroenteritis (TGE)		

Lesson 5: Herd Health Name _____

Swine Antibiotics

Objective: Become familiar with commonly used antibiotics.

Using a veterinary supply catalog (provided by your instructor) that carries antibiotics, complete the chart below, detailing the name of the drug, its use, withdrawal time, and any restrictions on it. The antibiotics can be given in injections or placed in feed.

Name	Uses	Withdrawal Time	Restrictions

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 6: Herd Management

Competency/Objective: Identify management factors important to profitable hog production.

Study Questions

1. **How does nutrition affect herd health?**
2. **What are the feeding phases for different stages of hog production?**
3. **How is production efficiency measured in swine?**
4. **What are factors to consider in reproduction?**
5. **What are steps in processing baby pigs?**

References

1. *Introduction to Swine Production (Student Reference).* University of Missouri-Columbia: Instructional Materials Laboratory, 1997.
2. Transparency Masters
   a) TM 6.1: Changing Dietary Requirements
   b) TM 6.2: Ear Notching Diagram
   c) TM 6.3: Ear Notching
3. Activity Sheet
   a) AS 6.1: Ear Notching

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 6: Herd Management

TEACHING PROCEDURES

A. Review

In Lesson 5, students learned the importance of herd health and how to develop and carry out a herd health program. Lesson 6 will focus on herd management for a swine operation.

B. Motivation

Show students TM 6.3 with ear notches drawn in. Have students try to figure out the litter number and pig number.

C. Assignment

D. Supervised Study

E. Discussion

1. Ask the students how nutrition affects herd health. Describe the simple stomach found in swine and discuss why swine diets are high in grain. List the components of a balanced diet on the board.

How does nutrition affect herd health?

Animals that are suffering from nutrient deficiencies are more susceptible to disease-causing organisms and do not achieve maximum performance.

a) Swine require proper levels of energy (from carbohydrates and fats), protein, vitamins, minerals, and water.
b) Producers should design a feed ration that will meet the requirements for the animal.

2. Ask the class to name different phases of swine production. List the phases on the board. Next, ask the students how swine are fed for each of these stages. Stress to the class that different phases of swine production have different nutritional requirements, and discuss the differences between them. Use TM 6.1 to illustrate changing requirements in weaned and growing and finishing pigs.

What are the feeding phases for different stages of hog production?

a) Gestation
   1) Gestation diets are generally lower in protein than any other swine diet.
   2) Gestating sows and gilts are usually fed four to six pounds of feed per head per day.
   3) Extra fiber is usually added to the diet shortly before farrowing to act as a laxative and reduce constipation.
   4) A good supply of fresh water should be available at farrowing time.
b) Lactation
   1) Lactation diets are higher in protein and energy than gestation diets to meet the energy needs of the female.
   2) The amount fed to the sows is gradually increased to full feed within five to seven days after farrowing.
   3) Generally, producers will feed lactating sows between twelve and twenty pounds per head per day.
   4) Lactating sows also require larger amounts of water than other pigs.

c) Weaning
   1) Weaning diets are the most critical swine diets because they provide the first feed the baby pig will consume.
   2) These diets are usually very high in the amino acids found in protein because weaning is a critical time for muscle growth, which requires protein.
   3) The level of protein is generally 18 to 22 percent, but it may be as high 26 percent.
   4) Feed generally contains milk and blood proteins.
   5) As the pig grows, the levels of protein are reduced because the pig's requirements decrease.
   6) Easy access to water is important as well.

d) Growing/finishing diets
   1) The level of protein is usually 14 to 16 percent.
   2) The amount of protein in the diet is gradually reduced.
   3) Also, many producers feed gilts separately from barrows, since gilts generally grow more slowly than barrows and require more protein to reach maximum levels of performance.

3. Ask students how swine producers measure efficiency. List the suggestions on the board. Discuss the importance of each method and what numbers would be acceptable to producers.

How is production efficiency measured in swine?

a) Days to 230 pounds
   1) This measure reflects the growth rate of market hogs.
   2) Fewer days on feed usually means that feed costs will be lower and translates into the ability to produce more animals.

b) Feed to gain
   1) Feed to gain is a measure of how many pounds of feed are necessary to produce a pound of gain in the pig.
   2) Pounds of feed fed is divided by pounds of pork produced.
   3) A lower feed to gain ratio is desirable, since the pigs will then require less feed and feed costs will be lower.

c) Gain to feed
   1) Gain to feed measures the efficiency of gain.
   2) Pounds of gain is divided by pounds of feed used.
   3) High numbers are desirable.

4. Have the class list some considerations concerning the reproductive management of a swine farm. List the factors on the board and discuss each in more detail.

What are factors to consider in reproductive management?

a) Swine have a gestation cycle that averages 114 days, so producers need to keep accurate breeding records to know which females will farrow and when farrowing will occur.

b) Producers may balance litter size by fostering pigs from large litters to sows with smaller litters; fostering should take place within 24 hours of birth for both litters.
   1) Fostering achieves a more uniform weaning size.
   2) It increases the survival rate.

c) Piglets are weaned when they are between 14 and 28 days of age.
   1) Most producers wean piglets from a group of sows on the same day to maintain the farrowing group.
   2) Sows will usually come into estrus three to seven days after weaning.
   3) Most producers will breed the female as soon after weaning as possible to maximize production.

d) Artificial insemination (AI) is becoming more common.
   1) Producers can purchase semen or collect semen from their own superior boars.

2) AI allows producers to use superior boars more extensively.
3) Producers will determine which female is in estrus and typically AI each female twice.

e) Sows usually have three years of productive life; after three years of farrowing, they generally experience a decline in productivity.

5. Ask students what needs to be done to baby pigs after birth. If possible, bring a litter of pigs in for a demonstration or go to a swine operation and observe how a litter of baby pigs is processed. Use TM 6.2 as a guide for a discussion of ear notching. Have students complete AS 6.1.

What are the steps in processing baby pigs?

a) Remove the navel cord and apply iodine to prevent infection.
b) Clip the needle teeth.
   1) Clipping prevents injury to the sow's udder.
   2) It also prevents injury to other pigs when fighting.
c) Dock the pig's tail to prevent tail biting.
d) Give an iron shot to prevent anemia.
e) Castrate the males at processing, or at one week of age.
f) Notch ears using a standard ear notching system.
   1) The ear is divided into quadrants; each quadrant can have one or two notches.
   2) Notches on the right ear indicate the litter number.
   3) Notches on the left ear identify the number of the piglet.
   4) Adding the numbers of the notches on each ear gives the litter and piglet numbers for that animal.
   5) The top of the right ear is notched to designate litter 81.

F. Other Activities

Obtain various feed brochures and develop a feeding program for a farrow-to-finish operation.

G. Conclusion

Swine must be fed diets with proper nutrition to ensure health and maximum growth. Swine producers should use phase feeding to meet the nutritional needs of the animals fed. Producers can use several methods to measure the efficiency of production in their hogs. They also need to manage reproduction in the swine herd properly to maximize production. Baby pigs should be processed within one day of farrowing.

H. Answers to Activity Sheet

AS 6.1

1. 5, 3
2. 10, 2
3. 9, 9
4. 27, 4
5. 51, 2
6. 2, 1
7. 12, 10
8. 100, 10
9. 11, 8
10. 7, 5

I. Answers to Evaluation

1. d

2. d
3. b
4. c

5. How many pounds of feed are necessary to produce a pound of gain in the pig

6. Animals that are suffering from nutrient deficiencies are more susceptible to disease-causing organisms and do not achieve maximum performance.

7. 30, 10
8. 83, 6

UNIT - INTRODUCTION TO SWINE PRODUCTION Name _____

Lesson 6: Herd Management Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. Which of the following diets are the most critical for the future development of a pig?

   a. Farrowing
   b. Gestation
   c. Lactation
   d. Weaning

2. What is the average length of the gestation cycle for swine?

   a. 110 days
   b. 200 days
   c. 150 days
   d. 114 days

3. What prevents anemia in baby pigs?

   a. Milk
   b. Iron shots
   c. Leptospirosis vaccine
   d. Carbohydrates

4. As the pig grows, the levels of what nutrient can be decreased?

   a. Carbohydrates
   b. Fats
   c. Protein
   d. Minerals

Complete the following short answer questions.

5. What does feed to gain measure?

6. What is the effect of nutrient deficiencies on the swine herd?

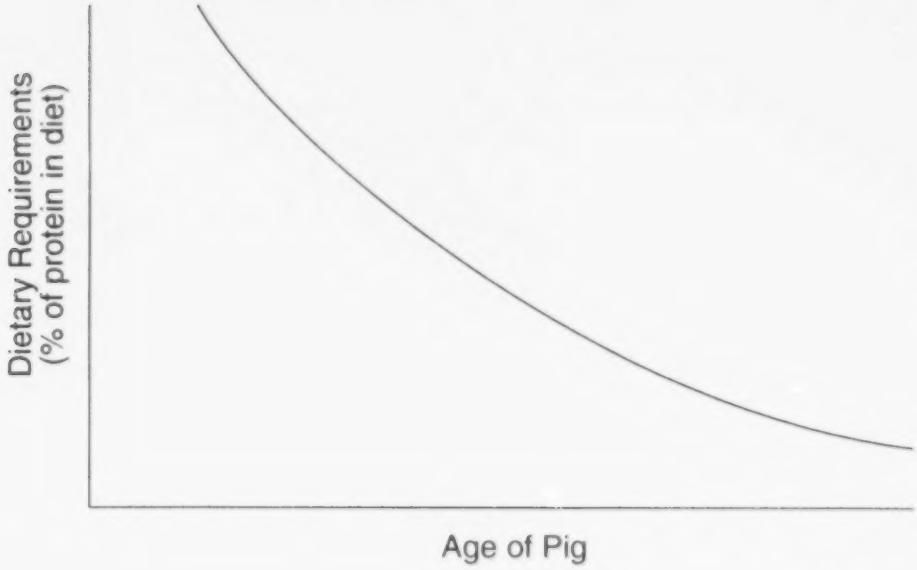
Identify the litter number and pig number for the pigs illustrated below.

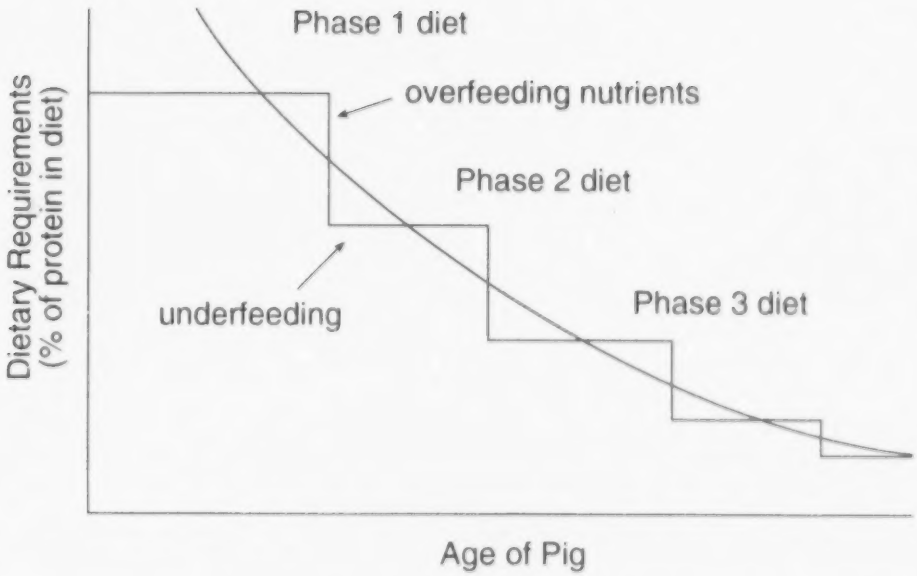
7. _____

8. _____

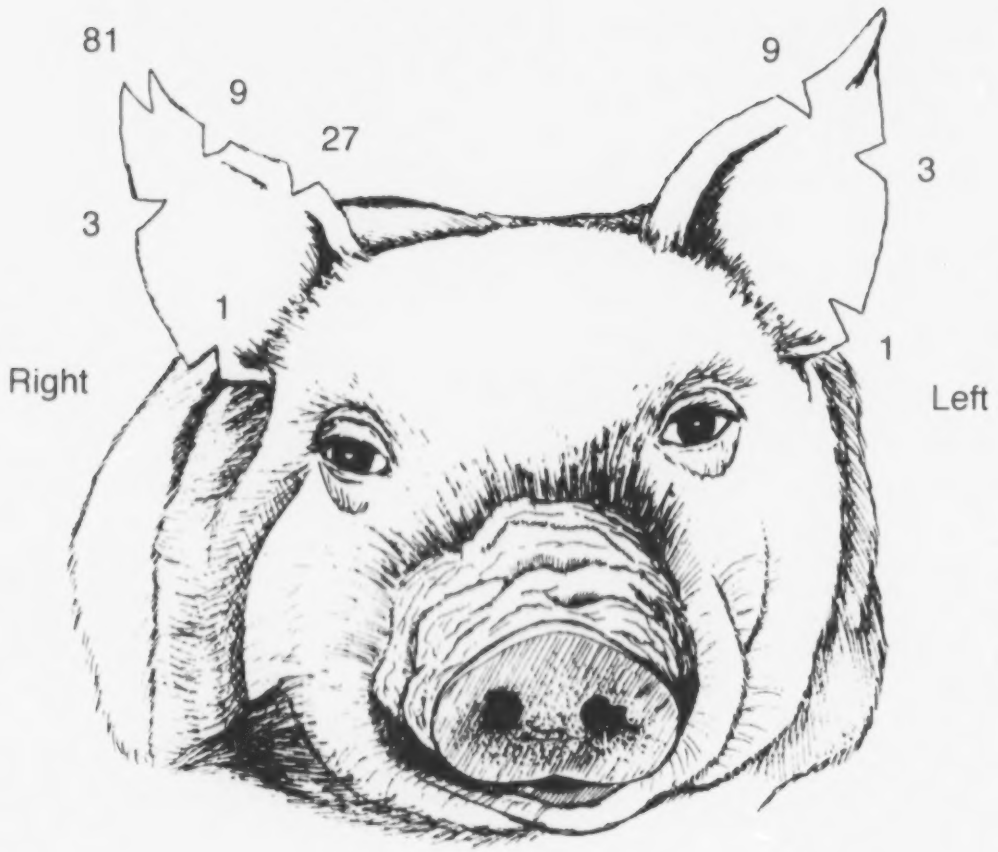
12

Changing Dietary Requirements

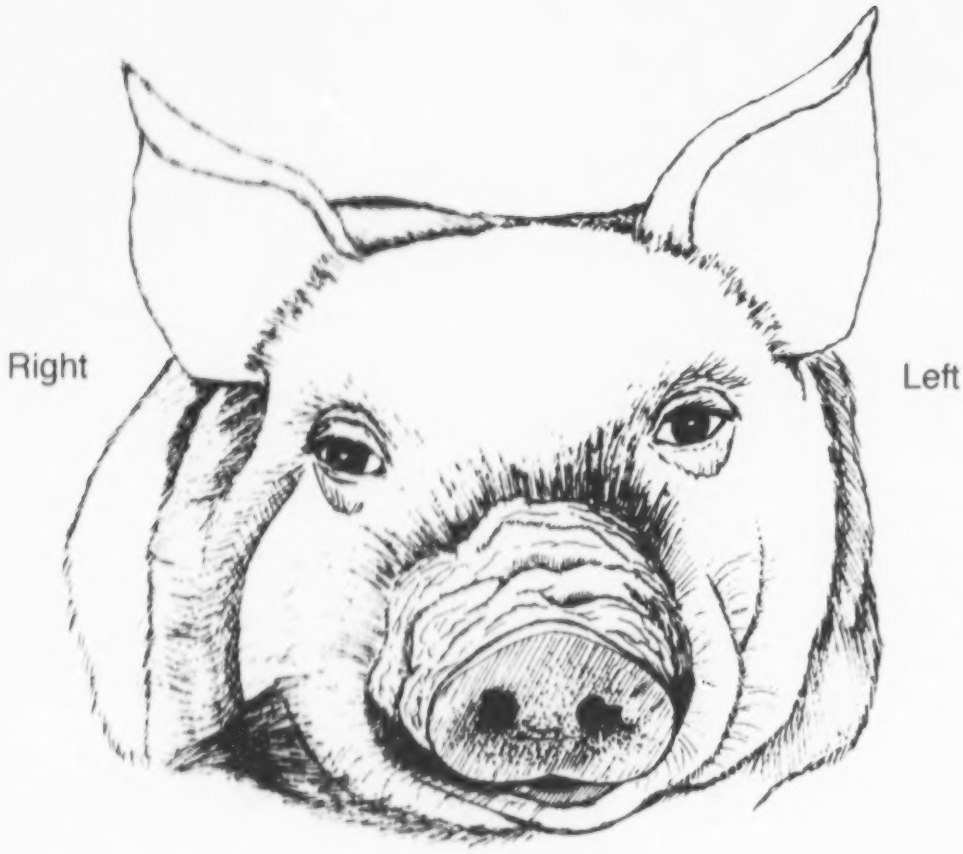




Ear Notching Diagram



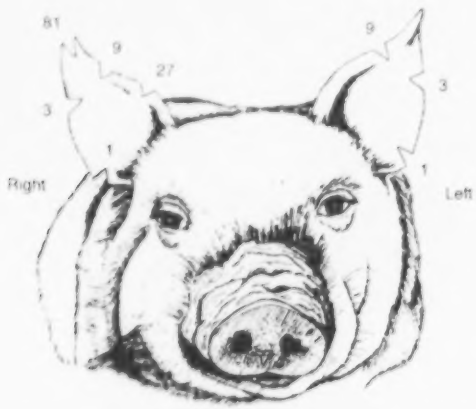
Ear Notching



Lesson 6: Herd Management Name _____

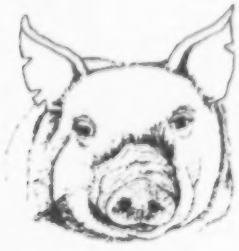
Ear Notching

Objective: Display an understanding of the universal ear notching system.

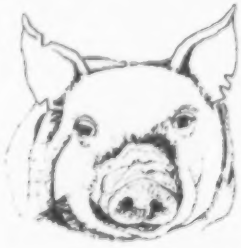


In the standard ear notching system, the litter number (right ear) is read first, followed by the pig number (left ear). To figure out the notch number, simply add the notches in the same ear together using the key above. For example, the following pig is identified as litter #12, pig #2.

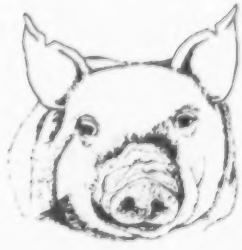
Identify the litter number and pig number for each pig illustrated.



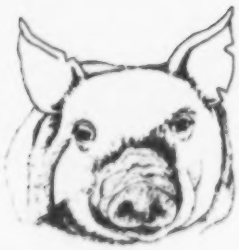
1. _____



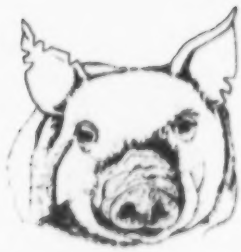
2. _____



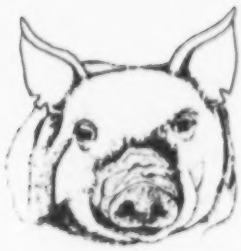
3. _____



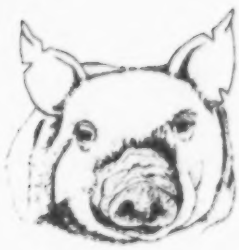
4. _____



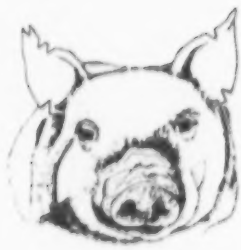
5. _____



6. _____



7. _____



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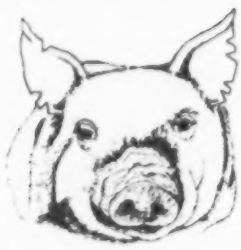
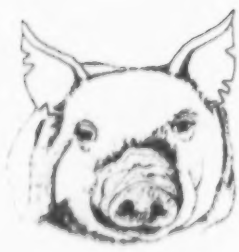


9. _____



10. _____

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 7: Industry Concerns

Competency/Objective: Assess issues concerning the swine industry.

Study Questions:

1. **What are consumer concerns?**
2. **How are manure nutrients managed on swine farms?**
3. **What is the difference between animal rights and animal welfare?**
4. **What is the swine industry doing to address these issues?**

References

1. *Introduction to Swine Production (Student Reference).* University of Missouri-Columbia: Instructional Materials Laboratory, 1997.
2. Activity Sheet
   a) AS 7.1: Debate--Swine Production and the Environment

UNIT - INTRODUCTION TO SWINE PRODUCTION

Lesson 7: Industry Concerns

TEACHING PROCEDURES

A. Review

Lesson 6 dealt with herd management practices such as proper nutrition, measuring efficiency of production, reproductive management, and processing baby pigs. Lesson 7 will conclude the swine unit by discussing consumer concerns about the swine industry. This lesson also describes the efforts that pork associations and producers are making to address these issues.

B. Motivation

Ask students whether they would like a large confinement operation to be built near their homes. Discuss their responses.

C. Assignment

D. Supervised Study

E. Discussion

1. Ask the class to list current consumer concerns about swine production. Write each on the board or overhead, and discuss each of them.

What are consumer concerns?

a) Effect on the environment
   1) Odor emission
   2) Pollution of ground water and waterways from untreated wastes in leaking storage facilities
b) Safety of pork - residues from antibiotics
c) Animal welfare
   1) Amount of room given to each animal
   2) Number of pigs in each building
   3) Failure of temperature regulation
   4) Inability to escape fire
d) Animal rights

2. Ask students how wastes are used on swine farms. Next, ask the class how producers manage the nutrients contained in the wastes. Emphasize that producers have to manage the nutrients contained in manure to prevent groundwater contamination from nutrient leaching. List the management steps on the board or overhead.

How are manure nutrients managed on swine farms?

a) Storage
   1) Lagoon
      (a) Similar to a pond
      (b) Designed to catch runoff from outside animal lots or to hold waste piped from buildings
      (c) Stores waste while the solids are broken down by bacteria into liquid and gases

(d) Must be sealed to prevent leaking, and in some soils may require a liner
(e) Must be approved by the Department of Natural Resources before construction

2) Pit structure
(a) Concrete pits two to eight feet deep found directly below the confinement building
(b) Collect and store liquid and solid wastes that drop through the slotted floor of the building
(c) Conserves nutrients during storage
(d) Must be sealed, with no leaks

b) Land application
1) Irrigation
(a) Involves pumping liquid waste through sprinklers on top of the ground
(b) Should be monitored constantly to ensure that waste is not leaking from the equipment and causing runoff
(c) Preferably done in spring and summer
2) Injection
(a) Mechanical procedure involving injecting, or "knifing," the waste into the soil
(b) Places manure directly under the soil surface, allowing the nutrients to be used more effectively by plants
(c) Reduces odor and runoff but is more time consuming and labor intensive

c) Maintaining a stable nutrient balance - Involves testing the soil for nutrient composition and testing the waste for nutrient content, which allows the producer to gauge how much liquid waste can be applied

3. Have students explain the difference between animal welfare and animal rights. Discuss the importance of providing for the welfare of animals from the producer's perspective.

What is the difference between animal rights and animal welfare?

a) Animal rights - Supporters believe that animals should not be used as resources by human beings.
b) Animal welfare - Animal welfare calls for the humane use of animals. People who endorse animal welfare believe that use brings with it a responsibility to the animals to provide appropriate care. Most pork producers are concerned with the welfare of the animals they raise, since ignoring their needs will affect growth and production, and ultimately influence profits.

4. Ask the class what the swine industry is doing to address the issues discussed in the first question. Have the students carry out the debate outlined in AS 7.1 after giving them the opportunity to research the topic. Students can use the school library, the Internet, or classroom resources for their research.

What is the swine industry doing to address these issues?

a) Effect on the environment
1) Environmental Assurance Program - developed to encourage producers to assess whether they are adequately protecting the environment
2) Research by the NPPC and state associations into reducing odor, protecting ground and surface water, and using the nutrients from swine wastes better
(a) Modifications to swine diets that can reduce odors
(b) Products that can be added to diets or to manure to decrease the amount of odor

b) Food safety - Pork Quality Assurance

1) Program designed to expose producers to proper production practices to improve management, reduce costs, ensure proper drug usage, and learn about food safety issues

2) Allows producers to develop an HACCP (Hazard Analysis Critical Control Points) program for their individual farms to identify potential problems in production practices that might reduce the quality of the pork produced

c) Animal welfare - The *Swine Care Handbook* contains information on such topics as management practices, proper facilities, environmental management within confinement buildings, nutrition, and health to help ensure that hogs receive humane care.

F. Other Activities

Obtain copies of Pork Quality Assurance (PQA) manuals for Levels 1, 2, and 3 from the Missouri Pork Producers Association. Go over them in more detail with the class, if time and interest permit.

G. Conclusion

Some aspects of pork production are of concern to the American public, including pollution of the environment, the safety of pork, animal welfare, and animal rights. With the help of state and national pork producers associations, producers are working to address these issues.

H. Answers to Evaluation

1. c
2. c
3. d
4. a

5. Maintaining a stable nutrient balance requires testing the soil for nutrient composition and testing the waste for nutrient content. These tests allow the producer to gauge how much liquid waste can be applied.

6. Irrigation and injection

7. Supporters of animal rights believe that animals should not be used as resources by human beings. Animal welfare calls for the humane use of animals. People who endorse animal welfare believe that use brings with it a responsibility to the animals to provide appropriate care.

8. To identify potential problems in production practices that might reduce the quality of the pork produced

UNIT - INTRODUCTION TO SWINE PRODUCTION Name _____

Lesson 7: Industry Concerns Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. What is the purpose of the *Swine Care Handbook*?

   a. To encourage producers to assess whether they are protecting the environment
   b. To teach consumers how to adopt and care for swine
   c. To ensure that hogs receive humane care from producers
   d. To expose producers to proper production practices to improve pork quality

2. Which of the following waste storage structures is similar to a pond?

   a. Pit
   b. Slurry store
   c. Lagoon
   d. Lake

3. Which of the following is an aspect of animal welfare that concerns consumers?

   a. Odor emission within confinement buildings
   b. Pollution of groundwater and waterways
   c. Right of animals to life
   d. Amount of space given to each animal

4. What is the purpose of the Environmental Assurance Program?

   a. To encourage producers to assess whether they are protecting the environment
   b. To expose producers to proper production practices to improve pork quality
   c. To ensure that hogs receive humane care from producers
   d. To teach people how to ignore odor from animal wastes

Complete the following short answer questions.

5. How is a stable nutrient balance maintained in soil to which animal wastes are applied?

6. What are the two types of land application systems for applying wastes?

7. What is the difference between animal rights and animal welfare?

8. What is the purpose of an HACCP program?

Lesson 7: Industry Concerns Name _____

Debate--Swine Production and the Environment

Objective: To understand consumer concerns about large scale-commercial swine production.

Your class will be conducting a debate over whether your county should ban commercial swine production because of the fear of pollution from improperly handled waste. Your instructor will assign you to a group to argue for or against the ban. Use any available resources to find information which supports your argument. Your research should take into account the views of both private and commercial swine producers as well as people not involved in swine production. It should answer the following questions.

- What local, state, and national regulations affect local swine producers?
- What is the economic impact of swine production locally?
- How many people would be directly affected if a ban occurred?
- What is the business structure of commercial operations?
- What environmental risks does swine production offer?
- Are there health risks to human beings from swine production?
- What can producers do to protect the environment?

When you have completed researching your position, your instructor will moderate the debate.

SWINE

American Berkshire Association
P.O. Box 2436, West Lafayette, IN 47906
Phone: (765) 497-3618 Fax: (765) 497-2959

American Landrace Association, Inc.
P.O. Box 2340, West Lafayette, IN 47906
Dr. Thomas F. Park, Jr., Director of Public Relations
Phone: (765) 497-3718 Fax: (765) 497-2959
Registrations 4,714 (Litters)
1 - IL; 2 - IN; 3 - MN; 4 - OH; 5 - IA

American Yorkshire Club, Inc.
P.O. Box 2417, West Lafayette, IN 47906
Darrell D. Anderson, Chief Executive Officer
Phone: (765) 463-3593 Fax: (765) 497-2959
Registrations 208,662
1 - IN; 2 - IL; 3 - IA; 4 - OH; 5 - MN
Breed Publication: Seedstock Edge

Chester White Swine Record Association
P.O. Box 9758, Peoria, IL 61612
Jack Wall, CEO/Executive Secretary/Treasurer
Phone: (309) 691-0151 Fax: (309) 691-0168
Registrations 27,342
1 - IN; 2 - IA; 3 - IL; 4 - OH; 5 - MO
Breed Publication: Seedstock Edge

Hampshire Swine Registry
P.O. Box 2807, West Lafayette, IN 47906
Phone: (765) 497-4628 Fax: (765) 497-2959

National Spotted Swine Record
P.O. Box 9758, Peoria, IL 61612
Jack Wall, CEO/Executive Secretary/Treasurer
Phone: (309) 693-1804 Fax: (309) 691-0168
Registrations 26,930
1 - IL; 2 - IN; 3 - MO; 4 - IA; 5 - OH
Breed Publication: Spotted News

Poland China Record Association
P.O. Box 9758, Peoria, IL 61612
Jack Wall, CEO/Executive Secretary/Treasurer
Phone: (309) 691-6301 Fax: (309) 691-0168

United Duroc Swine Registry
P.O. Box 2397, West Lafayette, IN 47906
Phone: (765) 497-4084 Fax: (765) 497-2959
Registrations 130,625
1 - IL, 2 - IN, 3 - NE, 4 - OH; 5 - MN
Breed Publication: Seedstock Edge

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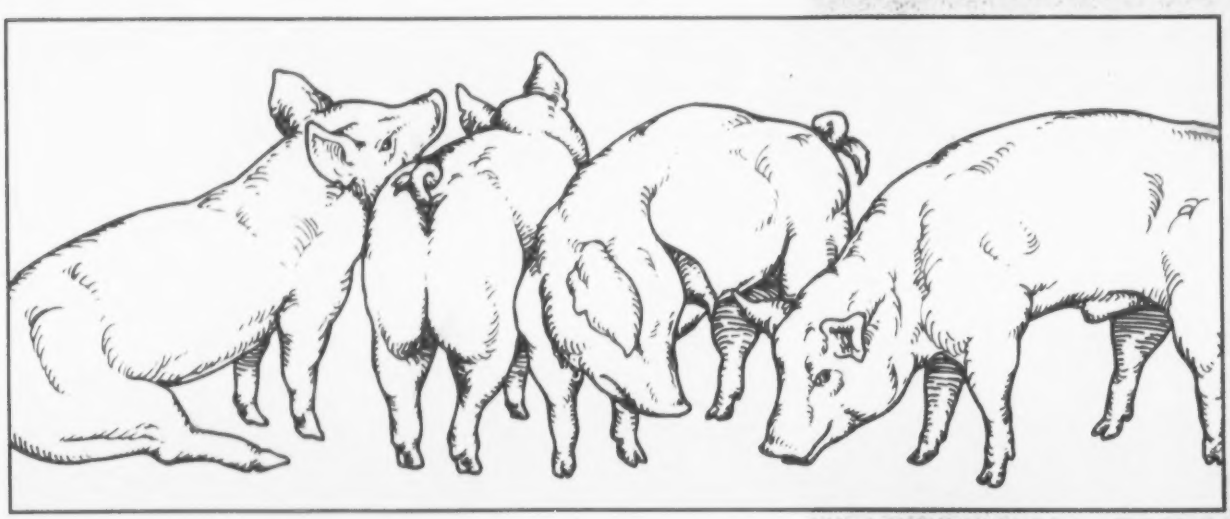
Introduction to

SWINE PRODUCTION

student reference



In cooperation with
Agricultural Education
Department of Practical
Arts and Vocational-
Technical Education
College of Education and
College of Agriculture,
Food and Natural
Resources
University of Missouri-
Columbia

In cooperation with
Agricultural Education
Section
Division of Vocational and
Adult Education
Elementary and Secondary
Education
Jefferson City, Missouri

Instructional Materials Laboratory
University of Missouri-Columbia

Available from:
Instructional Materials Laboratory
University of Missouri-Columbia
10 London Hall
Columbia, MO 65211
573-882-2883

The activity that is the subject of this report was supported in whole or in part by funds from the Department of Elementary and Secondary Education, Division of Vocational and Adult Education. However, the opinions expressed herein do not necessarily reflect the position or policies of the Missouri Department of Elementary and Secondary Education or the Division of Vocational and Adult Education, and no official endorsement should be inferred.

Student Reference

INTRODUCTION TO SWINE PRODUCTION

Writer:
Kevin Duncan
Instructional Materials Laboratory
University of Missouri-Columbia

Consulting Editor:
Richard Linhardt
Agricultural Education
University of Missouri-Columbia

Sherry Mahnken, Assistant Editor
Instructional Materials Laboratory
University of Missouri-Columbia

Produced by:
Instructional Materials Laboratory
University of Missouri-Columbia
10 London Hall
Columbia, Missouri 65211

Volume 30
Number 2

Catalog Number 10-4401-S
October 1997

ACKNOWLEDGMENTS

Recognition is given to the following advisory committee members for providing their valuable time and suggestions in developing this *Introduction to Swine Production* curriculum. The committee consisted of Brock Bailey, Jim Bellis, Leigh Burkhalter, Mike Cloud, Shawn Coats, Keith Davis, Scott Hess, Tom Hulshof, Scott Long, Delbert Lund, Jim Spain, and Glen Waters.

Appreciation is expressed to the following staff members of the Instructional Materials Laboratory for their efforts in producing this material: Phyllis Miller, Interim Director; Dan Stapleton, Assistant Director; Eileen Woody, Assistant Director; Veronica Feilner, Senior Editor; Cheryl Unterschutz, Graphic Designer; Kevin Gamble, Graphic Artist; Jan Trimble, Word Processor; and Jill Clark and Shelly Seabaugh, Editorial Assistants.

Sherry Mahnken, Assistant Editor
Instructional Materials Laboratory
University of Missouri-Columbia

Richard Linhardt, Associate Professor
Agricultural Education
University of Missouri-Columbia

FOREWORD

The development of the *Introduction to Swine Production* curriculum guide is the result of suggestions by the MVATA Teaching Aids Committee. The Swine Production Advisory Committee suggested the topics to be included and reviewed the materials.

This student reference contains seven lessons. Topics include an introduction to the swine industry, breeds of swine, principles of swine selection, production systems, herd health, herd management, and industry concerns. An instructor's guide can be purchased separately.

During the summer of 1981, the Missouri State Board of Education formally adopted the concept of "Instructional Management Systems" (IMS) as a priority for the 1981-82 school year. The Missouri Commissioner of Education described the IMS concept as a practical way of "organizing for excellence" in education. To meet the demand for greater productivity and accountability, the director of Vocational Education applied the elements of IMS to form the Vocational Instructional Management System (VIMS). The VIMS process provides a framework to use in planning and organizing to assure excellence in Missouri's vocational education system by focusing greater attention on the management of teaching and learning.

The instructor's guide to accompany this student reference incorporates the needed component parts to aid agriculture teachers in the implementation of VIMS.

Richard Linhardt, Associate Professor
Agricultural Education
University of Missouri-Columbia

Terry Heiman, Director
Agricultural Education
Department of Elementary and
Secondary Education

INTRODUCTION TO SWINE PRODUCTION

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The swine industry has a major economic impact on agriculture in Missouri. This unit will focus on modern swine production and important issues facing the industry.

Economic Implications

During the last decade, the swine industry has experienced tremendous change. During the record-setting year of 1995, more than 96 million hogs were processed into more than 17 billion pounds of pork. More than 200,000 swine producers operate nationwide. The swine industry generally ranks either fourth or fifth annually in farm cash receipts. Each year, producers sell more than $11 billion worth of hogs, which have a retail value of $30 billion.

In 1995, Missouri had approximately 5 percent of the hog operations nationwide. The state ranked seventh in the number of hogs and pigs produced. The top three counties in the state are Mercer, Sullivan, and Putnam, with close to one million head of hogs between them. Hog numbers in Missouri are illustrated in Figure 1.1.

Swine Terms

Like other industries, the swine industry uses many unique terms. Anyone involved in the swine industry should know and understand these terms.

Farrow - To give birth.

Gilt - A young female pig that has not yet farrowed.

Barrow - A castrated male pig.

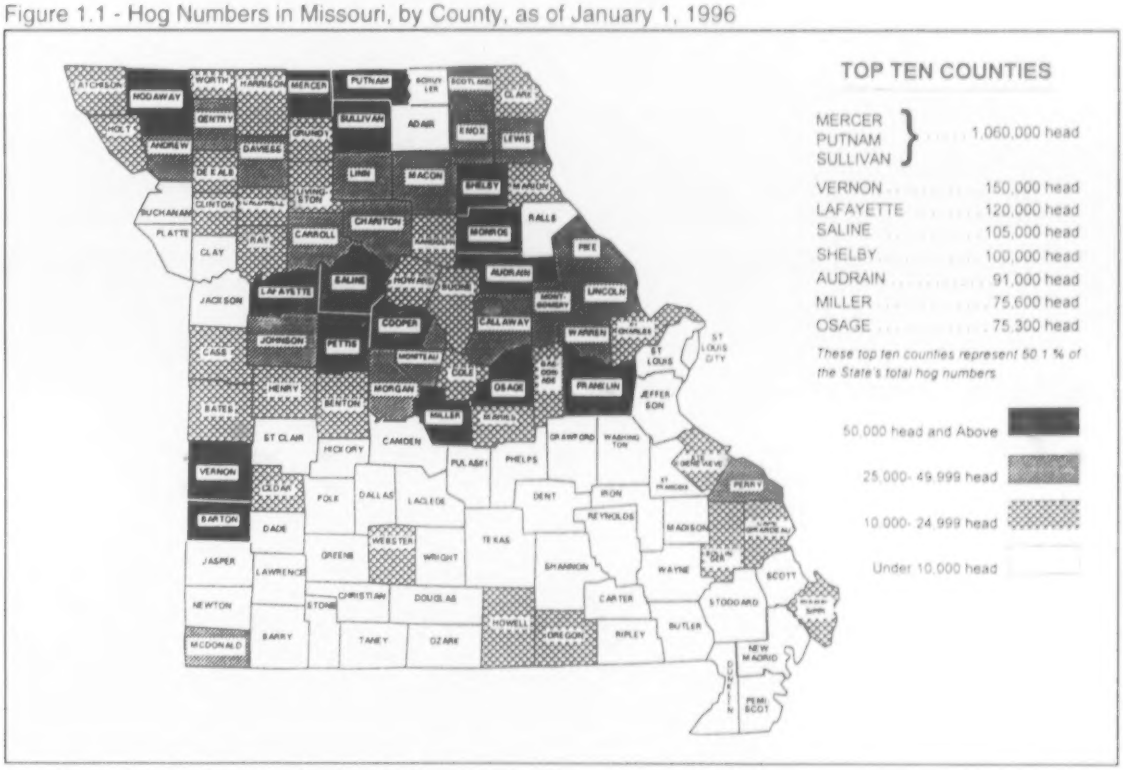
Boar - A male pig used for breeding.

Sow - A mature female hog.

Feeder pig - A gilt or barrow between weaning and finishing.

Market hog - A gilt or barrow weighing between 240 and 270 pounds and ready for processing.

Figure 1.1 - Hog Numbers in Missouri, by County, as of January 1, 1996



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Swine Facts

Body temperature - 102.5°F

Market weight - 253 lbs.

Avg. age at 250 lbs. - 170 days

Pigs per litter - 8.3 weaned nationally

Feed to gain ratio - 3 lbs. of feed:1 lb. of gain

Evolution of the Swine Industry

The trend in swine industry in the United States is toward fewer producers and larger operations. While more than 200,000 swine producers operate in the United States today, over 30 years ago approximately three million producers raised hogs. Twenty years ago, many swine producers operated farms with less than 100 sows. Currently, the industry is moving toward larger operations. These operations may range in size from 1,000 to 80,000 sows.

The location of the swine industry is also shifting. During the 1960s and 1970s, most of the swine production was centered in the Corn Belt states, such as Iowa, Minnesota, Illinois, Indiana, Nebraska, and Missouri. While these states still contain most of the hogs produced in the United States, North Carolina, Arkansas, Texas, Kansas, and Oklahoma have seen tremendous growth in hog numbers. In 1995, North Carolina ranked second in hog numbers. Large corporate expansions have accounted for much of this recent growth.

Today, a major focus of American swine producers is to expand pork exports. The export market enhances the economic returns of all swine producers. The swine industry slogan, "Pork, the other white meat," is aimed at influencing consumers worldwide to increase consumption of pork and pork products.

Production Systems

The major production systems of the swine industry are farrow-to-finish production, feeder pig production, and feeder pig finishing.

Farrow-to-finish swine production is the most common type of production. It covers the entire production process, from breeding to sales of market hogs. Gilts and sows are mated to boars or artificially inseminated. Females farrow a litter of pigs. The piglets are weaned, and the sows are bred again. The baby pigs are moved into a nursery until they weigh approximately 50 pounds and then to a finishing barn where they grow until they reach 240 to 270 pounds. The pigs are then sold as market hogs to provide pork for human consumption. Farrow-to-finish production is the most intensive production system and generally has the greatest requirements as to management skills, labor, and facilities.

Feeder pig production involves producing pigs to sell to other producers to be fed for market. Feeder pig producers have a herd of sows for breeding. Pigs are sold when they weigh approximately 50 pounds. The investment required for the operation is less than that for farrow-to-finish production. Most feeder pig producers in Missouri have a contract to produce pigs for a company involved in commercial swine production. The company then buys the pigs and sends them to feeder pig finishers, who are also under contract.

Feeder pig finishers purchase or receive pigs at approximately 50 pounds. They feed the pigs until they reach a market weight of 240 to 270 pounds. After the animal reaches market weight, the pig is processed into saleable pork and pork products. This system requires less labor and managerial ability than the other systems. The investment required is also lower than in farrow-to-finish or feeder pig production.

Business Structures

Before the current increase in corporate production, the vast majority of hogs were produced on privately owned family farms. Many family producers still raise hogs individually.

Some producers are involved in network production. In this type of production, a group of producers cooperates to decrease production costs and improve profits for each operation. Networking can involve collective marketing arrangements, purchasing supplies at a discount for member operations, or cooperative production of swine. In network production, one producer might raise feeder pigs to be finished by another producer in the network.

Some producers operate on a contract basis. The individual producer signs a contract to produce pigs for a company. The company owns the pigs and finances the operation, and the producer provides the facilities, equipment, and labor. The company makes many of the decisions about how the pigs are managed. The producer receives a fixed price per animal.

Over the last 10 years, many corporate investors have expanded their involvement in the swine industry. The goal of corporate farms is efficient production of a uniform product. Corporate farms are large-scale operations. They may also be vertically-integrated; in vertical integration, the company owns and controls all phases of the production process. Company A might therefore own complete farrow-to-finish production facilities, a feed mill that produces feed for its farms, and a processing plant.

Career Opportunities

With the wide scope of the swine industry, career possibilities are extremely diverse. Estimates suggest that over 700,000 jobs in the United States are linked to the swine industry.

Many career opportunities exist in the swine industry besides becoming a producer involved in one of the different production systems. Swine operations need employees to fill positions such as breeding manager, farrowing manager, and nursery manager; these positions involve overseeing these activities for the operation. A feed mill technician is responsible for producing feed for swine herds. An artificial insemination technician breeds sows and gilts using artificial insemination. Animal geneticists specialize in genetic research to develop more powerful medications and genetically superior animals. Animal health product sales representatives provide swine medications and other products to farm stores, veterinarians, and producers. Veterinarians often specialize in swine where large concentrations of hogs are found. Hog buyers buy market hogs to be processed into pork. USDA inspectors and quality control supervisors work in pork processing plants to help ensure that the food supply is safe and wholesome.

Summary

The swine industry is an important part of agricultural production in the United States, accounting for over $11 billion in farm receipts annually. Swine are produced in farrow-to-finish, feeder pig, and feeder pig finishing production systems. The swine industry is changing, with hogs being produced on larger farms at diverse locations nationwide. Corporate swine production is becoming more prevalent in the industry. Due to the diversity of the industry, young people interested in working with swine have a variety of career opportunities open to them.

Credits

Baker, Meelee, and Robert E. Mikesell. *Animal Science Biology and Technology.* Danville, Ill.: Interstate Publishers, Inc., 1996.

Gillespie, James R. *Modern Livestock and Poultry Production.* 5th ed. Albany: Delmar, 1997.

Harper, Allen F. "The Role of Swine Producer 'NETWORKS.'" gopher://gopher.ext.vt.edu:70/00/.docs/aps/aps-628 (30 July 1997).

Lawrence, John D., et al. "Producing and Marketing Hogs Under Contract." http://www.public.iastate.edu/~pigmap/PIH/6.txt (30 July 1997).

Lee, Jasper S., et al. *Introduction to Livestock and Poultry Production.* Danville, Ill.: Interstate Publishers, Inc., 1996.

Nix, Jackie. "Facts about Contract Livestock Agriculture." http://duplin.ces.state.nc.us/pubs/contract.html (30 July 1997).

Taylor, Robert E., and Ralph Bogart. *Scientific Farm Animal Production.* 3rd ed. New York: Macmillan Publishing, 1988.

1996 Missouri Farm Facts. Columbia: Missouri Agricultural Statistics Service, in cooperation with the Missouri Department of Agriculture and the U.S. Department of Agriculture, 1996.

Pork Issues Handbook. Des Moines: National Pork Producers Council, 1996/1997.

Success in the swine industry depends partly on a broad knowledge of the breeds of hogs used in production. Knowing the different breeds and their characteristics is important in making decisions about which breed to use in breeding programs. Producers also need to consider whether to use hybrid hogs in their operation.

Breeds of Swine

The major breeds of swine that are important in the industry today include the Berkshire, Chester White, Duroc, Hampshire, Landrace, Pietrain, Poland, Spotted, and Yorkshire. Differences between these breeds are apparent in color variation and ear type.

Berkshire - Berkshires are black with six white points--the tip of the tail, nose, and four feet--and have erect ears. Berkshires produce high-quality meat with excellent marbling and optimum color. The breed has recently lost much of its popularity in the United States because it has not kept up with the trend toward lean, heavily muscled, large-framed hogs. They were first imported from England in the early 1800s.

Chester White - These hogs are white with small, drooping ears. They were once very popular across the United States because of their durability and ruggedness. Chester Whites have good mothering ability. This breed was developed in Pennsylvania in the early 1800s.

Duroc - Duroc hogs are solid red in color and have drooping ears. Durocs are among the fastest-growing hogs available to producers. They are primarily used to produce fast-growing market hogs. Durocs were developed in the United States during the mid-1800s by crossing red hogs from New York and New Jersey.

Hampshire - Hampshires are black with a white belt around the front of the body including the front legs; they have erect ears. They are used to produce lean, heavily muscled offspring. Hampshire hogs originated in England and were first imported during the early 1800s.

Landrace - Landrace hogs are white with large, droopy ears that cover the entire face. They are extremely long-bodied and are used primarily as a maternal breed because of their mothering ability. This breed originated in Denmark and was imported during the 1930s.

Pietrain - Pietrain hogs are generally spotted with erect ears. They are the leanest and most heavily muscled hogs in the world. However, Pietrains often carry a stress gene linked to meat quality problems; the gene causes light-colored, watery pork. The breed is typically crossed with other breeds to produce terminal sires (boars used to produce market hogs of which none are kept as replacement breeding stock). Pietrains were imported from Germany and Poland.

Poland China - Like Berkshires, Poland hogs are black with six white points, but this breed has drooping ears. They have been used in programs to increase growth rates. The popularity of the breed has decreased recently across the country because it has not kept up with the trend toward leanness. Polands were developed in Ohio during the first half of the nineteenth century.

Spotted - Spotted swine were named for their color; they have black and white spots all over their bodies. They also have drooping ears. They have been used primarily because of their rapid growth. In the U.S. swine industry, spotted swine numbers are small in comparison to the numbers of animals of other breeds. Spotted swine originated in Indiana from the Poland China breed, and a purebred association was formed in 1914.

Yorkshire - This breed is solid white with erect ears. Yorkshire hogs are quite versatile in their uses throughout the swine industry. They have excellent mothering traits but can also be used to produce lean, heavily muscled, fast-growing market hogs. Yorkshires are also called Large Whites and were imported from England in the early 1800s.

Breed Selection

Most American swine producers typically use several breeds together in a crossbreeding program to produce fast-growing, lean, and muscular market hogs. Factors that should be considered are breeds used in the past, litter sizes, leanness, muscle, current growth rates, and efficiency in the conversion of feed to pork. Most producers will evaluate their situation and try to select breeds and individual animals that will help them correct their deficiencies. For example, if a producer is concerned with the mothering ability of the sow herd, he or she might consider using Landrace or Yorkshire hogs to improve maternal traits. Other producers may need to increase the amount of saleable meat on their market hogs and may select

Hampshires or Pietrains. The most important part of breed selection is finding breeds and individual animals that meet the needs of the producer.

Hybrid Hogs

Over the past twenty years, producers have started to use hybrid hogs instead of purebred animals. They believe that they can more closely select for specific traits, such as growth or number of pigs born alive. Hybrid hogs have been developed by crossing multiple breeds together and selecting for desired traits. Companies and seed stock producers offer hybrid hogs varying in use from a maternal to a terminal emphasis. The hogs typically are identified by using a number or code to describe the particular strain.

Breeding Systems

Two types of breeding systems are used in the swine industry. Straightbreeding involves mating two animals of the same breed, while crossbreeding is mating animals of different breeds. In the commercial swine industry, most of the producers use some form of crossbreeding system.

Inbreeding is one form of straightbreeding. Inbreeding is an attempt to concentrate desired traits in offspring. It involves mating two related animals. Closebreeding and linebreeding are two types of inbreeding. In closebreeding, the animals are closely related; an example is mating a brother and sister. Linebreeding involves mating animals that are slightly or distantly related, with only one shared ancestor. Inbreeding can be negative because of the risk of concentrating undesirable and even detrimental traits along with the desirable traits.

Outcrossing is a form of straightbreeding in which unrelated animals of the same breed are mated. Outcrossing is the most popular and safest type of straightbreeding, since it avoids the risks associated with inbreeding.

Crossbreeding, or mating animals of two different breeds, results in a hybrid offspring. Crossbreeding animals with desired traits is an attempt by the producer to maximize heterosis, or hybrid vigor. Heterosis results in improved performance, growth, and/or carcass traits. It is evident when the animal displays superior qualities in comparison to the average of its parents' traits.

Summary

Several breeds can be used in the production of swine. Producers should select breeds that work well in their production system. When breeding animals, swine producers use purebred and hybrid genetics to produce profitable offspring. Most commercial swine producers use some form of crossbreeding program.

Credits

Baker, Meelee, and Robert E. Mikesell. *Animal Science Biology and Technology.* Danville, Ill.: Interstate Publishers, Inc., 1996.

Ensminger, M. E. *Stockman's Handbook Digest.* Danville, Ill.: Interstate Publishers, Inc., 1992.

Gillespie, James R. *Modern Livestock and Poultry Production.* 5th ed. Albany: Delmar, 1997.

Lee, Jasper S., et al. *Introduction to Livestock and Poultry Production.* Danville, Ill.: Interstate Publishers, Inc., 1996.

Taylor, Robert E., and Ralph Bogart. *Scientific Farm Animal Production.* 3rd ed. New York: Macmillan Publishing, 1988.

Proper animal selection is one foundation of successful swine production. The choices made will affect producers' profits far into the future. Selection is important in many ways, from producing quality pork to animal health.

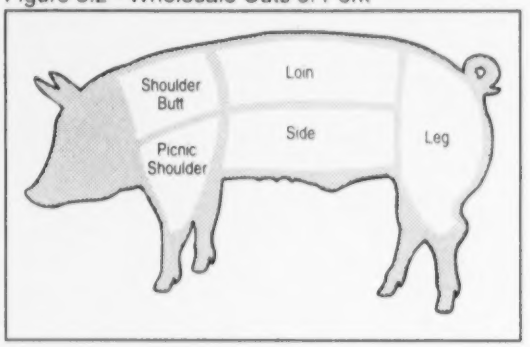
Parts of the Pig

To be able to communicate with individuals involved in the swine industry, one must become familiar with the proper terminology for the parts of the hog. Figure 3.1 at the bottom of this page is an illustration of the parts of a pig.

Wholesale Cuts of Pork

When hogs are processed into pork, the carcass is divided into wholesale cuts. The wholesale cuts are then sold to retail stores (e.g., the local grocery store). At that level, the wholesale cuts are processed into smaller retail cuts purchased by consumers. The wholesale cuts of pork, pictured in Figure 3.2, are the shoulder butt, picnic shoulder, loin, side, and leg.

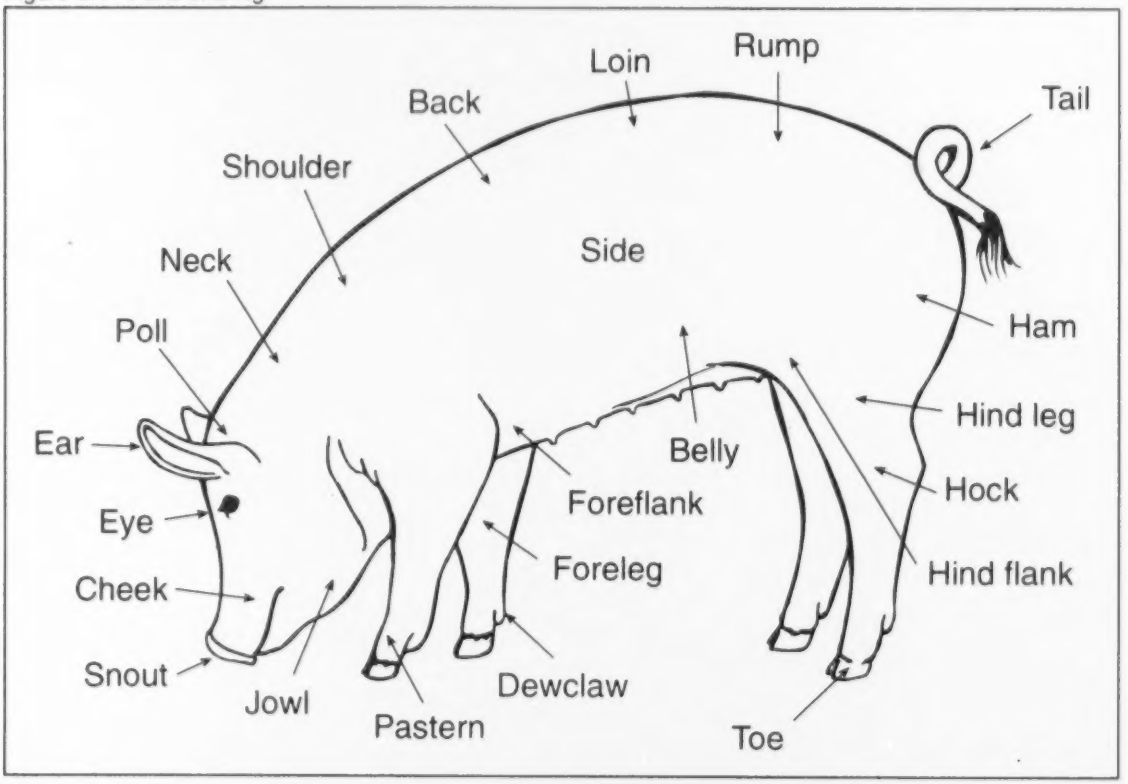
Figure 3.2 - Wholesale Cuts of Pork



Slaughter and Feeder Pig Selection

The demands of the consumer drive the selection of slaughter hogs. Retail consumers purchase lean and meaty cuts of pork. This trend has caused the industry to emphasize leanness over the last decade. Other factors important in slaughter hog selection are muscling, size/age, and soundness.

Figure 3.1 - Parts of a Pig



Leanness - Market hogs must be mostly free from fat to produce lean pork. When viewed from the top, a lean hog has an hourglass shape (Figure 3.3); the pig's loin will be narrower than its shoulder and ham regions. Also, lean hogs will be trim through the lower body.

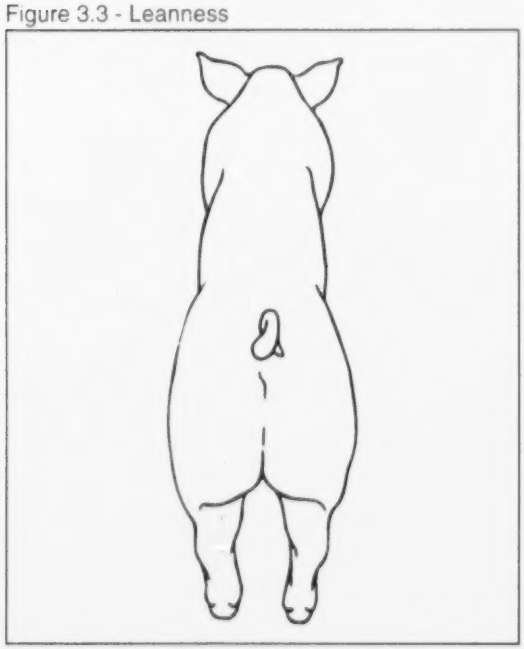
Muscling - Heavily muscled market hogs produce more saleable pork than more lightly muscled hogs. Hogs should be evaluated for the expression, or definition, of muscle instead of pure thickness. Often market hogs that are extremely wide over their tops are fatter than is desirable.

Size/age - To be profitable, market or slaughter hogs need to reach the appropriate size at an acceptable age. Currently, the packing industry is demanding heavier market hogs. Market weight is usually between 240 and 270 pounds, reached at an age of 140 to 170 days.

Soundness - Soundness refers to the physical ability of the animal to get up and down and move with relative ease. Sound animals with good feet and legs are more productive and generally grow more quickly.

Selecting feeder pigs for purchase involves some of the same criteria. Feeder pigs should be selected for health, soundness, leanness and muscling, and frame size. Health and soundness are emphasized because the feeder pigs are young and light. They must grow and perform until they reach market weight.

Figure 3.3 - Leanness



Health - Producers should purchase feeder pigs from healthy herds and vaccinate them against the major swine diseases. Unhealthy pigs should not be purchased whatever their price.

Soundness - Being able to move with ease is a priority when selecting 50-pound feeder pigs. Young pigs that are injured or not sound will be a high-risk investment. Production will be decreased because they are more susceptible to diseases, grow more slowly, and have higher mortality rates.

Leanness/muscling - Feeder pigs should be extremely lean and display muscle expression at 50 pounds to maintain their leanness until they reach market weight. Leanness and muscle both contribute to the future cutability of the market hog. Cutability is the ratio of the percentages of saleable meat and fat from a carcass.

Frame size - Large-framed animals are desirable because they mature later and stay leaner at higher weights. Small-framed pigs should be avoided. Large-framed animals are taller, and the cannon bones in their front legs are longer than those of smaller-framed animals.

Breeding Swine Selection

The selection of hogs to be used as breeding animals should focus on the efficient production of lean pork. Breeding animals should be evaluated for reproductive soundness, skeletal soundness, growth and potential production, frame size, and leanness and muscling. Superior animals excel in all these traits. Producers should never select animals on a single trait without considering the others.

Reproductive soundness - Reproductive and skeletal soundness are priorities in the selection of breeding hogs. Reproductively sound boars have two functional testicles. Females have fully developed vulvas and functional underlines (the outline of the underbody) with a minimum of six teats and preferably seven teats per side.

Skeletal soundness - Most hogs are raised indoors on concrete floors. They must be skeletally sound to survive, grow, and reproduce in confinement.

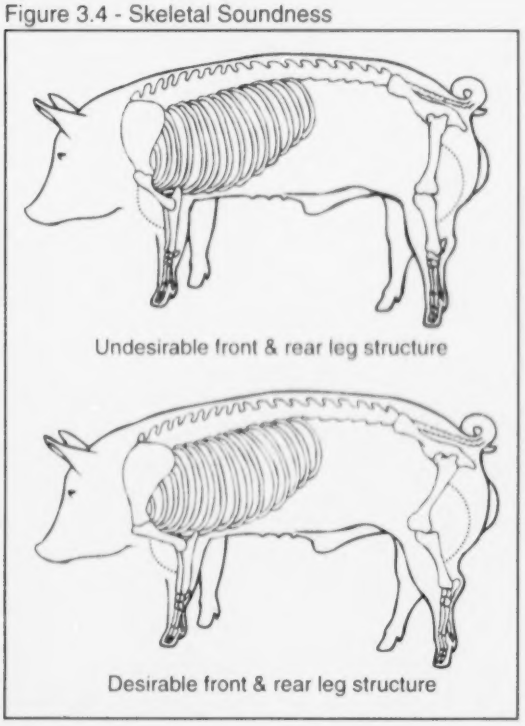
Hogs need to have proper skeletal angulation; the legs should be straight and set at the proper angle from the body (see Figure 3.4). Hogs should also be able to move with ease.

Growth/potential production - Breeding animals are selected for fast growth and high production. Producers should note the age of the animal when it reaches 230 pounds, referred to as "days to 230"; fewer days are more desirable. Breeding gilts should be selected from large litters of pigs, because a sow that can raise a large litter has mothering ability, which is a desired trait. They must also have an acceptable body capacity. A large body capacity allows animals to consume greater amounts of feed.

Frame size - A large frame size is important in producing lean animals at high weights. Large-framed animals remain leaner at heavier weights than do small-framed animals.

Leanness/muscling - To produce lean and heavily muscled market hogs, breeding animals must share these traits. Breeding stock should be leaner and more muscular than average. Producers should use ultrasound to look at backfat and loin eye area, which are the best indicators of leanness and muscularity. Adjusted backfat scans at 240 pounds should be between .6 and 1.1 inches, while loin eye areas should be more than six square inches.

Figure 3.4 - Skeletal Soundness



Undesirable front & rear leg structure

Desirable front & rear leg structure

Along with making a visual appraisal, producers can look at several important indexes when selecting breeding animals. They are the Sow Productivity Index (SPI), Terminal Sire Index (TSI), and Maternal Line Index (MLI). They use Expected Progeny Differences (EPDs) to evaluate the potential worth of animals for breeding; EPDs look at the expected performance of the offspring of an animal. All three of the indexes assign an average parent a specific value; a higher number indicates an animal that is superior in the traits examined.

Sow Productivity Index (SPI) - The SPI looks at EPDs for 21-day litter weight and number born alive. SPI numbers above the average indicate animals that should produce daughters that have larger and heavier litters. The SPI should be used when selecting animals for reproductive traits. Each point of the index equals $1 per litter produced by the daughters of a boar or sow. Litters of sows or boars with an SPI of 105 are five dollars more valuable than an average animal with a value of 100.

Terminal Sire Index (TSI) - The TSI uses data on leanness and growth, looking at EPDs for the number of days to 230 and for backfat. Animals with above average TSI values will produce animals that are leaner and grow more quickly than average. TSI should be used to select terminal sires. Points on the index are worth $.10 per pig sold, or $1 for every ten pigs sold. A boar with a TSI of 110 should sire pigs $1 more valuable than those from an average boar valued at 100 points (10 points x $ .10 = $1.00 per pig).

Maternal Line Index (MLI) - The MLI looks at EPDs for both reproductive traits (21-day litter weight, number born alive) and growth data (days to 230, backfat). Animals with above average MLI ratios will have higher reproductive and growth values. This index should be used to select replacement gilts. Like the SPI, points are worth $1 per litter produced by the daughters of a boar or sow.

Indexes are determined by using data from the animal and its ancestors and offspring. The breed associations calculate the ratios, which are generally used for registered animals. Individual producers can calculate variations on the indexes mentioned above.

Summary

Individuals interested in swine production must learn the proper names for the parts of a hog and for wholesale cuts. Producers should select slaughter and feeder animals to produce lean pork for consumers. Selection of breeding hogs involves making a visual appraisal and using indexes such as the SPI, TSI, and MLI.

Credits

Boggs, Donald L., and Robert A. Merkel. *Live Animal Carcass Evaluation and Selection Manual.* 4th ed. Dubuque: Kendall/Hunt Publishing Company, 1993.

Gillespie, James R. *Modern Livestock and Poultry Production.* 5th ed. Albany: Delmar, 1997.

Lee, Jasper S., et al. *Introduction to Livestock and Poultry Production.* Danville, Ill.: Interstate Publishers, Inc., 1996.

Taylor, Robert E., and Ralph Bogart. *Scientific Farm Animal Production.* 3rd ed. New York: Macmillan Publishing, 1988.

"What are EPDs?" http://www.ansc.purdue.edu/stages/stg user.html#What are EPDs (2 June 1997).

Swine production is a complex business that requires proper management to be profitable. Producers need to be aware of potential returns and various marketing options.

Facilities

As discussed in Lesson 1, swine are often raised on large farms. Most of the hogs on these farms are raised in confinement. In total confinement production, producers raise all of the hogs in pens inside buildings. The design of these facilities must take into account the needs of the hogs for proper temperature, ventilation, sanitation and manure management, and food and water. Facility costs for farrow-to-finish production, feeder pig production, and feeder pig finishing are quite expensive. Many producers have hundreds of thousands of dollars invested in facilities.

Farrow-to-finish swine producers have the most facility requirements. The producers require the following facilities: farrowing house, nursery, growing/finishing barns, gestation/breeding barns, feed handling and storage, and manure storage.

The farrowing house consists of farrowing crates where the female is placed to farrow, or give birth. The crate provides a safe place for the baby pigs by keeping the mother from laying on them. The farrowing crate also has a waterer and a feeder for both the mother and the litter. Generally, animal wastes drop through the floor and are flushed into a manure storage facility.

After weaning, the sow is returned to the gestation/breeding barn. The sow will be bred again and will remain in the barn to gestate until farrowing. The piglets are placed in a nursery. The nursery where the baby pigs are taken is usually quite warm so that they remain healthy and productive. After the pigs reach approximately 50 pounds, they are placed in a growing/finishing barn where they remain until they reach market weight.

Other facilities needed for swine production include feed handling and storage facilities and manure storage facilities. Manure storage usually takes the form of a lagoon or pit. A lagoon is an artificial manure holding area similar to a pond. A pit is a metal or concrete manure storage facility.

Feeder pig producers will need many of the same facilities as farrow-to-finish producers. Feeder pig producers require a farrowing house, nursery, gestation/breeding barn, feed handling and storage, and manure storage. Since they sell their pigs, the growing/finishing buildings are not necessary.

Feeder pig finishers usually have the fewest facility requirements. Finishers typically receive pigs that are ready to be placed in growing/finishing barns. They also require feed handling and storage and manure storage facilities.

Production Costs

Production costs vary greatly within each production system and from producer to producer. Costs are affected by the type and size of the operation, labor requirements, loans, and other factors. Producers will have two categories of costs: fixed costs and variable costs. Fixed costs will be similar for all producers despite the type of production system used. They include depreciation, interest on loans, repairs, taxes, and insurance. Variable costs may differ depending on the production system. The major variable cost in raising swine is the cost of feed. Other variable costs for swine production include medications, veterinary care, equipment, facilities, and the cost of the stock.

Of the three production systems, farrow-to-finish producers have the most costs because they own the pigs for the longest time. Producers must purchase breeding stock and maintain a breeding herd as well as raise market hogs. Feeder pig producers have similar costs, but they do not have to pay for the feed and facilities needed to finish the slaughter hogs for market. Feeder pig finishers have the fewest costs, since they do not have the expenses connected to breeding and raising young pigs. Feed, feeder pig stock, and facilities are their main expenses.

Returns on Production

Like production costs, potential returns from each system vary. For example, the returns of farrow-to-finish producers primarily come from the sale of slaughter hogs. The typical market hog is sold at 240 to 270 pounds and an average price (depending on the current market) of $40 to $60 per cwt (100 pounds). A 250-pound pig sold at $50 per cwt is worth $125. If a producer could average twenty pigs sold per sow each year, he or she could generate $2,500 in returns per sow.

The main income of feeder pig producers comes from selling feeder pigs. Depending on the market,

feeder pig prices generally range from $30 to $55, with an average of $45. If a sow produces twenty feeder pigs per year that sell for $45 per pig, she can generate $900 in income per year.

The returns of feeder pig finishers come from selling slaughter hogs. While they may receive the same amount of money for their hog as farrow-to-finish producers, feeder pig finishers must pay for the feeder pigs. If each hog is worth $125 and was purchased for $45, the finisher will receive $80.

Looking at the potential returns, farrow-to-finish production seems to have the greatest profits. However, as discussed in the preceding section, it also has the highest costs. Profits may be higher with one of the other production systems.

Marketing Options

Once a producer has raised a pig, he or she must sell it to make a profit. Three major marketing options are available to farrow-to-finish producers and feeder pig finishers: buying stations, auction markets, network marketing, niche marketing, and lean-based pricing.

Buying stations are owned and operated by various packers. The packers purchase market hogs from producers at a set market price, which is generally based on the lean yield from the last three loads sold by the producer. The producer then either delivers the hogs to the local station or hauls them directly to the processing plant.

Auction markets sell market hogs to the highest bidder. Usually, the auction market is privately owned, and the owner charges the producer a small fee to sell the animals at auction. Recently, auction markets have been decreasing in popularity for selling market hogs. Company-owned buying stations are replacing them.

In network marketing, independent producers cooperate to ship their hogs together as a group. They can therefore market a larger number of animals. Their goal is to get a better price for their hogs.

One of the newest and most popular ways of marketing hogs is a lean-based pricing system, which has grown out of the demand for leaner pork and emphasizes lean, heavily muscled slaughter hogs. Producers send the hogs directly to the packing plant to be processed. The carcasses are then measured for backfat and muscling. The measurements are put into a formula that computes the percentage of muscle containing 5 percent fat. The higher the percentage, the more valuable the carcass is. Percent muscle usually ranges from 45 to 60 percent, with 49 percent being standard. The packing plant pays a premium for hogs with more than 49 percent muscle, while hogs with less than 49 percent are penalized in price.

Producers can also market their animals through niche markets. Producers can potentially realize greater profits through value-added marketing. Rather than selling a live animal, a pork producer might sell the actual food product, like a whole hog ready for roasting or individual cuts, including hams, bacon, or loins, to consumers or food distributors. Producers may cooperate with meat processors or packing houses in value-added ventures. The producer pays the processor for slaughtering the hogs and processing the meat and then sells the meat to retail stores, restaurants, distributors, or directly to consumers. Some producers may have their own slaughtering and processing facilities. By adding value to their pork, producers hope to take a larger share of the profits along the food distribution channel, instead of having those dollars go only to processors and distributors.

Feeder pig producers generally have a contract with a company or with individual feeder pig finishers. The producer receives a set amount for each pig produced to the desired weight and/or age specified in the contract.

Summary

The three production systems used in producing swine vary as to the facilities needed, costs, and returns on the pigs marketed. Swine producers require different types of facilities, depending on the production system. The costs connected to these facilities are only one of the costs of swine production. Producers have many other fixed and variable costs; the cost of feed is the major production cost for all three production systems. Farrow-to-finish producers have the highest costs and returns of the three production systems. The major marketing options available to farrow-to-finish producers and feeder pig finishers for selling hogs are buying stations, auctions, network marketing, lean-based pricing systems, and niche markets. Feeder pig producers generally are under contract to produce pigs.

Credits

Ensminger, M. E. *Stockman's Handbook Digest.* Danville, Ill.: Interstate Publishers, Inc., 1992.

Gillespie, James R. *Modern Livestock and Poultry Production.* 5th ed. Albany: Delmar, 1997.

Lee, Jasper S., et al. *Introduction to Livestock and Poultry Production.* Danville, Ill.: Interstate Publishers, Inc., 1996.

Pork Issues Handbook. Des Moines: National Pork Producers Council, 1996/1997.

Swine Care Handbook. Des Moines: National Pork Producers Council, 1996.

Taylor, Robert E., and Ralph Bogart. *Scientific Farm Animal Production.* 3rd ed. New York: Macmillan Publishing, 1988.

As discussed in previous lessons, swine production often occurs on a large scale in a confined setting. This type of environment increases the opportunities for diseases to spread among swine (although it reduces their spread from farm to farm or by other animals). Swine producers have to be able to keep diseases from spreading to produce healthy and productive pigs.

Swine Diseases

Swine are generally hardy animals, but they are susceptible to a variety of diseases. Producers can prevent most diseases by using good health management protocols, or they can control them by using vaccines. The major swine diseases are erysipelas, leptospirosis, pneumonia, porcine reproductive and respiratory syndrome (PRRS), pseudorabies, rhinitis, and transmissible gastroenteritis (TGE).

Erysipelas - A bacterium causes this disease. Pigs suffering from erysipelas are slow growing and sometimes lame. Hogs with severe erysipelas often have red skin lesions. Animals with this disease frequently die. Producers should vaccinate pigs against erysipelas at six to eight weeks of age if it is present in the herd.

Leptospirosis - Leptospirosis is a reproductive disease caused by bacteria that results in abortions and the birth of weak or dead pigs. Females and males should be vaccinated against leptospirosis. Producers should vaccinate females two to three weeks before breeding.

Pneumonia - Pneumonia is a respiratory disease caused by bacteria. It usually does not cause death. However, the disease causes chronic coughing and reduces growth and efficiency. Producers can vaccinate pigs for some strains of pneumonia, but good management is the best prevention. Good sanitation and isolation of infected animals are two ways to prevent the disease. Pigs also should not be exposed to cool and drafty conditions.

Porcine reproductive and respiratory syndrome (PRRS) - PRRS has recently become the most profound health problem in swine herds across the United States. It is a viral disease that is spread from contact between hogs and between humans and hogs. The disease can cause abortions, mummified pigs, and stillbirths; it can also result in chronic respiratory problems throughout the herd. PRRS is hard to prevent and treat, but producers can vaccinate hogs against it. They should also buy breeding stock that is free of the disease.

Pseudorabies - Pseudorabies is a viral disease that is spread from hog to hog through body fluids. The disease cannot be treated, and it causes a high death rate in young pigs. Pigs experience paralysis and run a fever. Sows with pseudorabies may abort, or the pigs may be stillborn. Pseudorabies is a difficult disease to control when an outbreak occurs. Producers must use a zero tolerance policy when dealing with pseudorabies. They should purchase all breeding stock from herds certified free of pseudorabies. Vaccines can prevent the spread of the disease.

Rhinitis - Rhinitis is caused by bacteria. It results in the degeneration of the bones in the pig's snout. The snout will then appear twisted. Pigs usually become infected at a few weeks of age. Vaccinating sows and baby pigs against rhinitis can prevent the disease.

Transmissible gastroenteritis (TGE) - TGE is a preventable viral disease that usually affects young pigs most critically. The disease causes severe diarrhea. The death rate is close to 100 percent when young pigs contract TGE. Producers can vaccinate pigs against TGE, but vaccines are not effective in controlling the disease. Proper sanitation plays a major role in preventing outbreaks.

Reducing the Spread of Disease

Swine producers can reduce the spread of disease in several ways. They include biosecurity measures, proper sanitation, and the purchase and use of disease-free breeding stock.

Biosecurity involves preventive measures designed to reduce exposure to disease. These measures help to isolate diseased animals, keeping them from contaminating others. Many swine operations use biosecurity to varying degrees. Typically, swine operations limit the number of outside visitors. If they do allow visitors, the visitor showers in and puts on clean clothes and shoes before entering the facilities. Biosecurity also involves limited access to critical areas such as the farrowing house and nursery, because pigs are the most vulnerable to disease when they are young. Some biosecurity plans specify that certain people can only enter particular buildings. For example, people working in the farrowing house could not go into other swine

buildings because they might carry disease-causing bacteria or viruses back to the farrowing house. An outbreak of disease could cause large losses.

Proper sanitation is also important to herd health. Producers should clean and wash new animals before allowing them into the facilities. After they have moved all of the pigs out of a facility, the building should be cleaned using a pressure washer to remove waste. They should then disinfect the facility.

Another important preventive measure is the purchase and use of disease-free breeding stock. Many swine producers who sell breeding stock to others have strict health programs to ensure that their animals are free from disease. Their herds may be validated as specific pathogen free (SPF) herds, which means they are declared free of certain diseases. Blood tests are done on the animals before sale to ensure that they do not have any diseases. All incoming breeding stock should go through an isolation and acclimation period lasting 45 to 60 days in which they are tested for diseases and then exposed to cull animals from the facility in which they are to be placed. Using artificial insemination can reduce the spread of disease among breeding stock.

Herd Health Programs

Herd health programs vary from producer to producer and within production systems. However, most producers vaccinate animals for disease whenever possible. A good practice for all farrow-to-finish and feeder pig producers is to take blood samples from their animals and have them evaluated for specific diseases, which they can then treat.

Farrow-to-finish producers are involved in all phases of production. They have the most extensive herd health program because they must prevent health problems throughout the breeding, farrowing, and growth phases. Producers should use blood tests to reveal health problems and then target those problems with vaccines. They should also buy disease-free breeding stock, practice biosecurity, and administer preventive antibiotics in the feed given to the pigs. In addition, they should use products to control external and internal parasites. Pigs must be treated for parasites at regular intervals.

Feeder pig producers focus on breeding, farrowing, and raising the young pigs until they weigh approximately 50 pounds. Producers should purchase disease-free breeding stock and use the same biosecurity programs as farrow-to-finish producers. They should also take blood samples to discover specific health problems and vaccinate their animals for them. Producers also need to add preventive antibiotics to the pigs' feed and control external and internal parasites.

Feeder pig finishers usually have the fewest problems with disease. They own the pigs for a short time, with no breeding, gestation, or farrowing taking place. Most feeder pig finishers will purchase vaccinated feeder pigs and use antibiotics in their feed. They also practice necessary biosecurity measures and treat animals for parasites.

Administering Medications

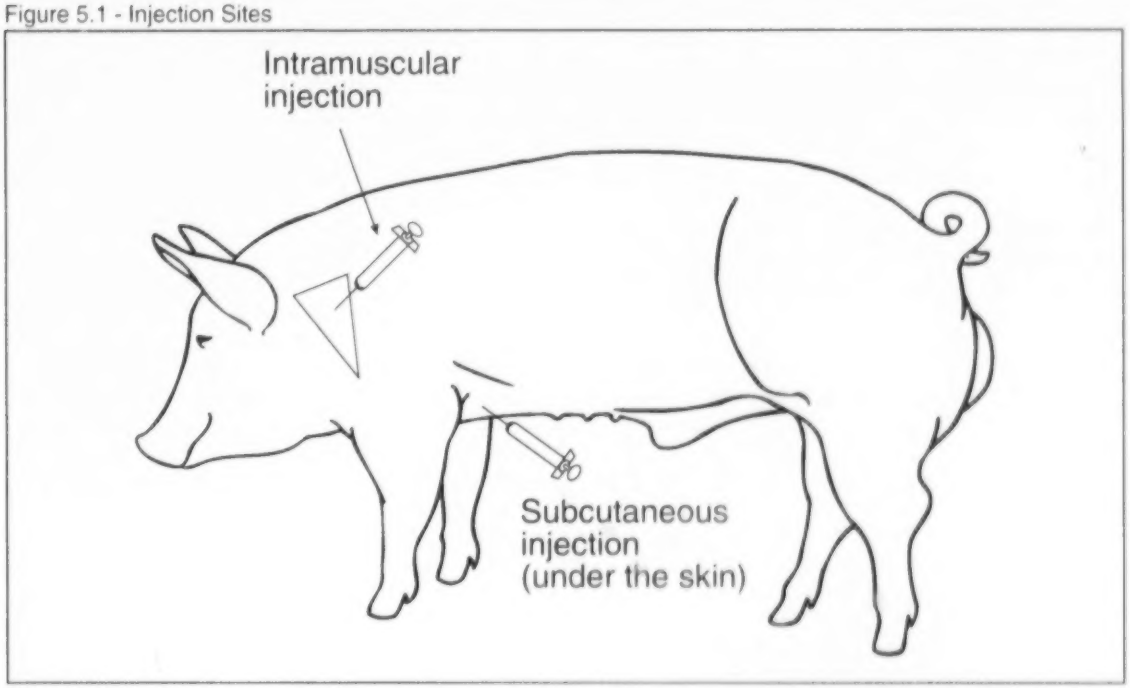
Swine producers need to know how to administer medications to keep their pigs healthy. They typically use subcutaneous and intramuscular injections plus medicated feed to help prevent and treat diseases. Figure 5.1 shows injection sites. To ensure that they produce high quality, safe pork, producers must be cautious and observe proper dosage, usage, and withdrawal times when using any medication. Withdrawal times tell producers how long the medicine takes to clear out of an animal's system. After the specified time, the animal can be sold for human consumption.

Subcutaneous (Sub-Q) injections are injections given between the skin and muscle. Most subcutaneous injections are given just behind the front leg in the loose skin of the foreflank, between the leg and stomach. This type of injection is recommended because of the potential for carcass damage when injections are made into muscle tissue.

Intramuscular (IM) injections are injections made into the muscle. Injections should always be given in the neck of the pig and never in the rump or ham area, because the meat from the neck area is of a lower value.

Most swine producers use medicated feeds to help prevent disease and promote growth. The feed contains small amounts of USDA-approved antibiotics. Pigs consume the medication as they feed.

Figure 5.1 - Injection Sites



Summary

Pigs can contract many different diseases. Producers use a variety of methods to help reduce the spread of disease, including biosecurity measures, proper sanitation, and the purchase of disease-free breeding animals. They need to identify specific health problems and work to reduce their effects. Swine diseases can generally be prevented through the use of disease-free breeding stock, biosecurity, and vaccinations. Producers should use subcutaneous injections whenever possible.

Credits

Baker, Meelee, and Robert E. Mikesell. *Animal Science Biology and Technology*. Danville, Ill.: Interstate Publishers, Inc., 1996.

Ensminger, M. E. *Stockman's Handbook Digest*. Danville, Ill.: Interstate Publishers, Inc., 1992.

Gillespie, James R. *Modern Livestock and Poultry Production*. 5th ed. Albany: Delmar, 1997.

Lee, Jasper S., et al. *Introduction to Livestock and Poultry Production*. Danville, Ill.: Interstate Publishers, Inc., 1996.

Pork Issues Handbook. Des Moines: National Pork Producers Council, 1996/1997.

Pork Quality Assurance Levels I, II, III. Des Moines: National Pork Producers Council, 1994.

Swine Care Handbook. Des Moines: National Pork Producers Council, 1996.

Taylor, Robert E., and Ralph Bogart. *Scientific Farm Animal Production*. 3rd ed. New York: Macmillan Publishing, 1988.

Herd management is a critical component of success in the swine industry. Management includes nutrition, reproduction, pig processing, and measuring production efficiency.

Nutrition

Swine are monogastric animals with a simple stomach that has one compartment. Because of the structure of the stomach, swine cannot digest much roughage. Swine diets therefore contain large amounts of grain, usually corn.

Proper nutrition is an essential part of maintaining herd health. Animals that are suffering from nutrient deficiencies are more susceptible to disease-causing organisms and do not achieve maximum performance. Swine require proper levels of energy (from carbohydrates and fats), protein, vitamins, minerals, and water in their diet. Producers should have nutrient analysis done on samples of the grain they have produced to learn the exact nutrient composition of the grain. The producer can then design a feed ration that will meet the nutritional requirements of the animal.

Feeding Phases

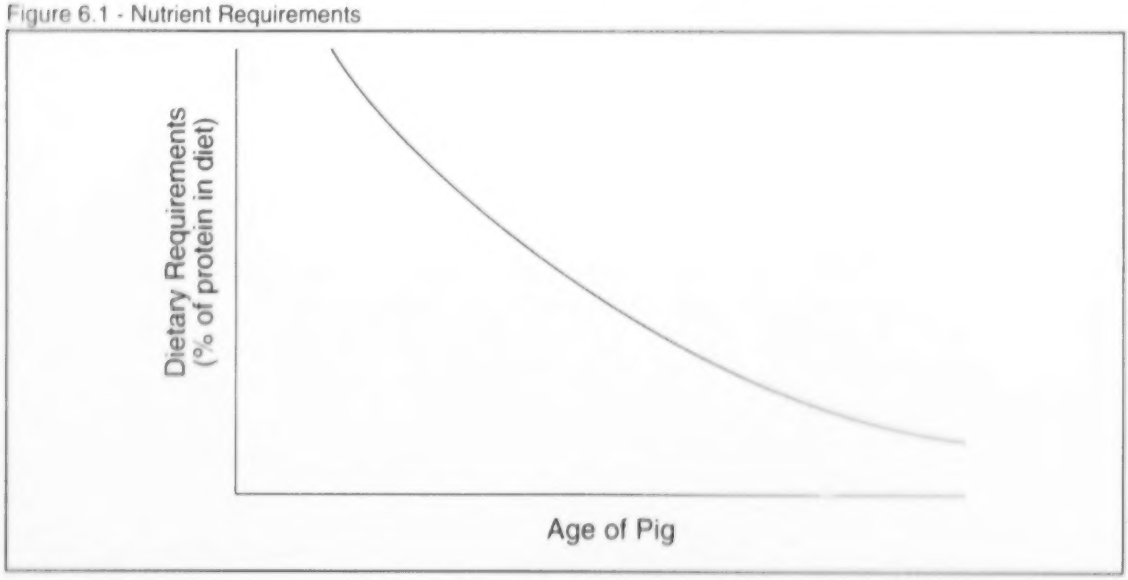
Swine production can be divided into various phases: gestation, lactation, weaning, and growing and finishing. Pigs have various nutritional needs throughout the different phases.

Gestation diets are generally lower in protein than any other swine diet. Gestating sows and gilts are usually fed four to six pounds of feed per head per day depending on the body condition of the animal and environmental conditions. Extra fiber is usually added to the diet shortly before farrowing to act as a laxative and reduce constipation. A good supply of fresh water should be available at farrowing time.

To meet the energy needs of the female, lactation diets are higher in protein and energy than gestation diets. The amount fed to the sows is gradually increased to full feed within five to seven days after farrowing. Generally, producers will feed lactating sows between twelve and twenty pounds per head per day depending on body weight and litter size. Lactating sows also require larger amounts of water than other pigs.

Weaning diets are the most critical swine diets because they provide the first feed the baby pig will consume and affect the future development of the pig. These diets are usually very high in the amino acids found in protein because weaning is a critical time for muscle growth, which requires protein. The level of protein is generally 18 to 22 percent, but it may be as high 26 percent. Feed generally contains milk and blood proteins. As the pig grows, the levels of protein and amino acids are reduced because the pig's requirements decrease. The graph in Figure 6.1 illustrates this change. A phase feeding program may be used to meet the changing nutritional needs of young pigs. Easy access to water is important as well.

Figure 6.1 - Nutrient Requirements



Growing and finishing diets may also be fed in phases in which the amount of protein varies. The level of protein is usually 14 to 16 percent. The amount of protein in the diet is gradually reduced. Also, many producers feed gilts separately from barrows. Gilts generally grow more slowly than barrows and require more protein to reach maximum levels of performance. Feeding them separately allows producers to match the diet to the needs of the pig.

As the graph in Figure 6.2 illustrates, swine producers are better able to meet the nutrient requirements of the pig by phase feeding. The animals will then perform closer to their genetic potential. Producers will also save money because they do not overfeed the pigs.

Production Efficiency

Swine producers measure production efficiency for finishing pigs in several ways. Some of the most common are: days to 230 pounds, feed to gain, and gain to feed.

Days to 230 pounds is a reflection of the growth rate of the producer's market hogs; it indicates the number of days between farrowing and reaching a market weight of 230 pounds. Pigs that grow more quickly will take fewer days to reach this weight. Fewer days on feed usually means that feed costs will be lower and translates into the ability to produce more animals with the given facilities.

Feed to gain is a measure of how many pounds of feed are necessary to produce a pound of gain in the pig. To calculate feed to gain, producers simply divide the pounds of feed fed by the pounds of pork produced, or the number of animals multiplied by the pounds each gained.

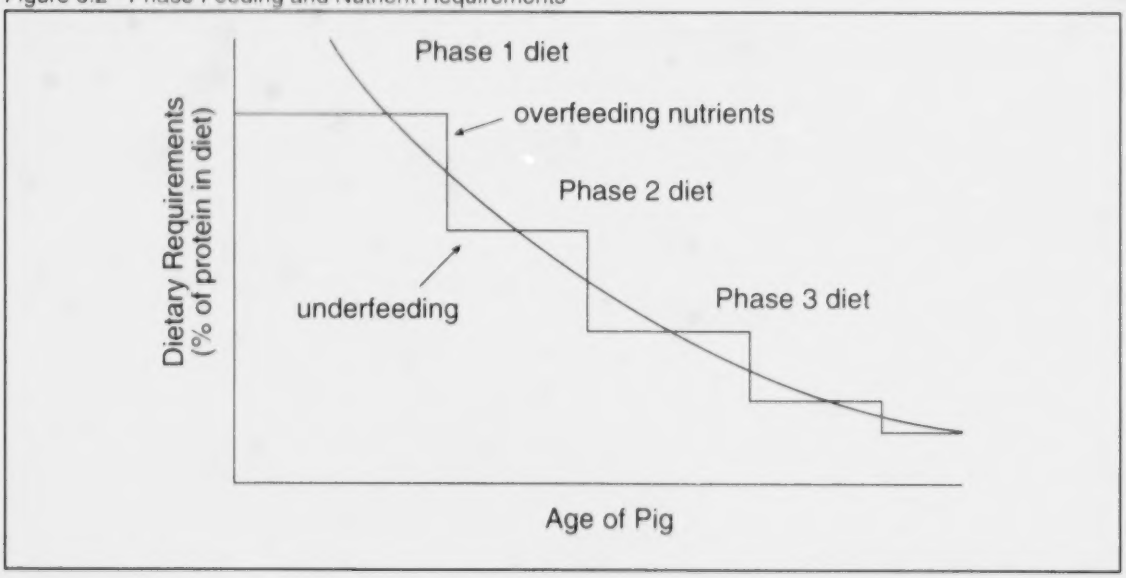
Suppose a producer fed 6,000 pounds of feed to 10 pigs. The producer purchased the pigs at 50 pounds and sold them at 250 pounds. Feed to gain for these pigs is calculated below.

$$\frac{6000\ \textit{pounds feed}}{10\ \textit{pigs} \times (250\ \textit{lbs.} - 50\ \textit{lbs.})} = \frac{6000}{2000} = 3{:}1$$

For every three pounds of feed consumed the pigs gained one pound in weight. A lower feed to gain ratio is desirable, since the pigs will then require less feed. Feed costs will therefore be lower.

Gain to feed is a measure of the efficiency of gain. It is calculated by dividing pounds of gain by the pounds of feed fed. High numbers are desirable. For example, if a pig consumed 600 pounds of feed and gained 200 pounds, the pig would have a feed efficiency of one to three (200/600). Producers often compare gain to feed when selecting animals to be used as reproductive replacements for the herd.

Figure 6.2 - Phase Feeding and Nutrient Requirements



Reproductive Management

Proper reproductive management is required for a producer to maximize production. The gestation cycle in swine lasts an average of 114 days. Producers need to keep accurate breeding records to know which females are due to farrow and when farrowing will occur. Sows should be placed in the farrowing house several days before their due date.

After farrowing, swine producers may take pigs from large litters and foster them to sows with small litters to balance litter size; fostering should take place within 24 hours of birth for both litters. This practice helps achieve a more uniform weaning size. Fostering also helps increase the survival rate of pigs. Fostering should be done as soon after birth as possible to ensure success. The largest piglets in the litter should be fostered.

Most producers will wean piglets when they are between 14 and 28 days of age, depending on their production system. They wean piglets from a group of sows on the same day to maintain the farrowing group. Sows will usually come into estrus three to seven days after weaning. Most producers will breed the female as soon after weaning as possible to maximize production.

Artificial insemination (AI) is becoming more common in the swine industry. Producers may purchase semen or buy superior boars and collect semen from the boars on the farm. AI allows superior boars to be used more extensively than in natural mating. When using AI, producers will check gilts and sows for estrus (heat) and then typically artificially inseminate the animal twice. Signs of estrus in sows and gilts include restlessness, mounting other hogs, and swelling of the vulva.

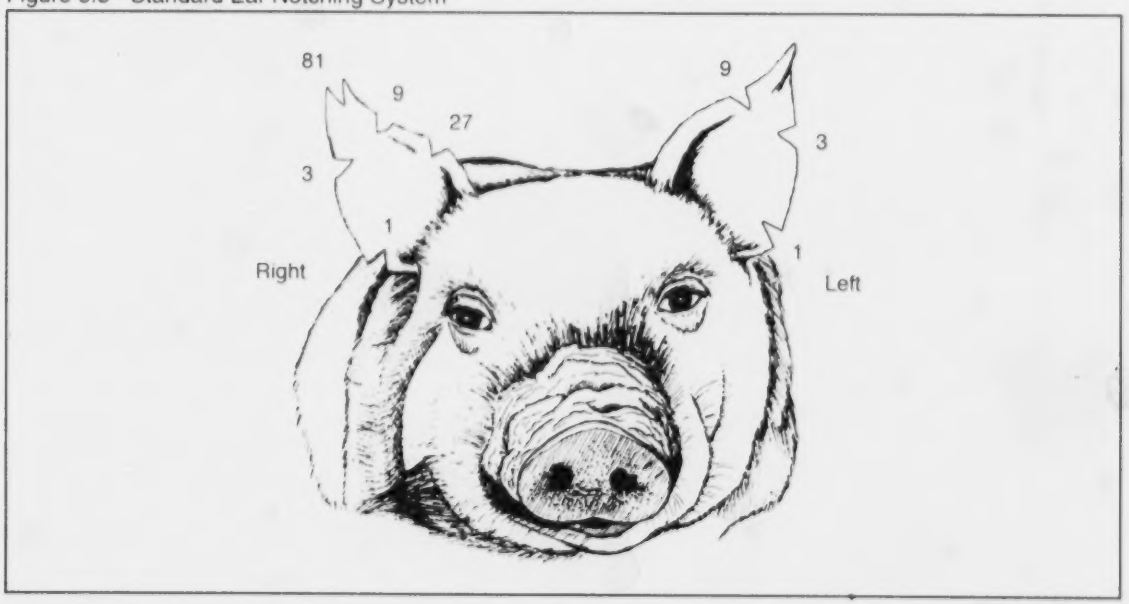
An important factor for producers to remember is that sows usually have three years of productive life. After three years of farrowing, they generally experience a decline in productivity.

Processing Baby Pigs

After the sow farrows, piglets are usually processed at one day of age. The producer should remove the navel cord soon after the birth. Iodine is then applied to the pig's navel to prevent infection. Producers clip the needle teeth from the piglet so it will not injure the sow's udder when nursing and will not hurt other pigs when fighting. They should also dock the piglet's tail to prevent tail biting. Baby pigs are given an iron shot which will help prevent anemia. Some producers will also castrate the males at processing. Others will let the pigs reach approximately one week of age before castrating the boars.

Pigs must be ear notched using an ear notching system. Ear notching is a permanent and easy-to-read form of identification. Several different systems of ear notching can be used to identify pigs. Figure 6.3 shows a standard system of ear notching.

Figure 6.3 - Standard Ear Notching System



It can be used to identify up to 161 litters. The ear is divided into quadrants. Each quadrant can have one or two notches. Notches on the right ear indicate the litter number; notches on the left ear identify the number of the piglet. Adding the numbers of the notches on each ear gives the litter and piglet numbers for that animal. In this system, after the eightieth litter, the top of the right ear is notched to designate litter 81.

Summary

Swine producers must make sure they meet the nutrient needs of the animals for proper health and production. Their diets will vary depending on the stage of growth or production. For example, phase feeding involves feeding diets with different levels of protein at different stages to match the animal's requirements. Various methods can be used to measure the efficiency of production, such as the number of days to 230 pounds, feed to gain ratios, and gain to feed. Proper reproductive management is necessary for efficient breeding. After farrowing, several steps should be followed when processing the piglets.

Credits

Baker, Meelee, and Robert E. Mikesell. *Animal Science Biology and Technology.* Danville, Ill.: Interstate Publishers, Inc., 1996.

Boggs, Donald L., and Robert A. Merkel. *Live Animal Carcass Evaluation and Selection Manual.* 4th ed. Dubuque: Kendall/Hunt Publishing Company, 1993.

Ensminger, M. E. *Stockman's Handbook Digest.* Danville, Ill.: Interstate Publishers, Inc., 1992.

Gillespie, James R. *Modern Livestock and Poultry Production.* 5th ed. Albany: Delmar, 1997.

Lee, Jasper S., et al. *Introduction to Livestock and Poultry Production.* Danville, Ill.: Interstate Publishers, Inc., 1996.

Swine Care Handbook. Des Moines: National Pork Producers Council, 1996.

Taylor, Robert E., and Ralph Bogart. *Scientific Farm Animal Production.* 3rd ed. New York: Macmillan Publishing, 1988.

The production of swine can be a complex business. Producers must take into account not only the needs of the operation but also the concerns of consumers, which may affect their attitudes toward the industry and the consumption of pork. The swine industry is working to address these concerns.

Consumer Concerns

The swine industry is similar to other American agricultural industries in that consumers have concerns about various aspects of the industry. Confinement swine production has increasingly come under public scrutiny. Producers raise hogs in confinement for a variety of reasons, including increased efficiency, the ability to control the environment and reduce stress, and ease of waste management and feeding. However, some consumers are troubled by the factory-like conditions in which swine are produced and the effects of raising hogs in this way. In particular, consumers focus on the environmental problems associated with swine production, food safety, animal welfare, and animal rights.

Large-scale confinement operations have increased concerns among consumers and producers about the effect of swine production on the environment. Confinement swine production can produce a large amount of waste. Producers must store these wastes until producers can properly apply them to the land as fertilizers. They can emit unpleasant odors. Consumers are concerned with odor emission and its effects and the potential for the pollution of groundwater and waterways from untreated wastes in leaking storage facilities.

The safety of pork is another issue that concerns consumers. Some consumers believe that producers give too many antibiotics. They worry that pork may contain residues from these antibiotics.

The welfare of pigs is another concern of consumers. In swine production, pigs are often raised inside and are not allowed to go outside. Consumers question whether the amount of room given to each animal is adequate and whether the buildings contain too many pigs. They also worry about the consequences for the pigs if temperature regulation fails in the confinement building or a fire breaks out and they cannot escape.

The debate over animal rights is also of interest to the American public. Some groups, such as People for the Ethical Treatment of Animals (PETA), believe that animals have rights. They feel that humans should therefore not use animals for food or research.

Managing Manure Nutrients

To meet consumer concerns and protect the environment, pork producers must manage the disposal of animal waste products carefully. Because of the high volume of wastes resulting from hogs raised in confinement, producers must have an efficient system for handling manure that includes well-designed waste storage facilities. Manure is typically stored in lagoons or pit structures before being applied to the land as fertilizer.

Lagoons are artificial structures similar to ponds. They are designed to catch runoff from outside animal lots or to hold waste piped from buildings. While the waste is stored inside the lagoon, the solids are broken down by bacteria into liquid and gases. Lagoons have to be sealed to prevent leaking, and in some soils may require a liner. The Department of Natural Resources must approve them before construction.

Pit structures are concrete pits two to eight feet deep that are found directly below the confinement building. Liquid and solid wastes drop through the slotted floor of the building and are collected and stored in the pit. Nutrients are conserved during storage. Pit structures must be sealed, with no leaks.

Land application of swine wastes occurs in two basic ways: irrigation or injection. For lagoons, most producers use irrigation systems to apply the remaining liquid onto farm land. In pit structures, the pit is emptied and applied to the soil using either irrigation or injection methods.

Irrigation involves pumping the liquid waste through sprinklers on top of the ground. Producers need to monitor irrigation equipment constantly to ensure that waste is not leaking from the equipment and causing runoff into waterways. Spring and summer are the preferred times to irrigate with swine wastes.

Injection is a mechanical procedure that involves injecting, or "knifing," the waste into the soil. The manure is placed directly under the soil surface, allowing the nutrients to be used more effectively by plants. Injection reduces odor and runoff but is more time consuming and labor intensive to operate.

Maintaining a stable nutrient balance is a major key to using waste nutrients from swine production effectively. Manure can be applied to supply nitrogen, phosphorus, and potassium to the soil for use by plants, which take in these nutrients through their roots. Producers must properly balance the amount of nutrients in the soil with the amount of nutrients applied in manure and commercial fertilizers. They should first test the soil for nutrient composition and test the waste for nutrient content. These tests will allow them to gauge how much liquid waste can be applied to specific fields. Swine producers should work closely with the Soil Conservation Service (SCS) to develop and carry out a nutrient utilization program.

Producers must be careful not to oversupply nutrients to the soil. When excessive amounts of nutrients are applied, the potential for nutrient leaching increases. Nutrients can cause problems if seepage causes ground water contamination.

Animal Welfare and Animal Rights

Animal rights and animal welfare are two terms that reflect a concern with the well-being of animals. They differ over the issue of use. Animal rights supporters believe that animals should not be used as resources by human beings, whatever the benefits of their use are to humans. Animal welfare, however, calls for the humane use of animals. People who endorse animal welfare believe that use brings with it a responsibility to the animals to provide appropriate care to ensure their well-being.

Most pork producers are concerned with the welfare of the animals they raise. They assume responsibility for meeting the needs of their pigs for such things as food, water, shelter, and health care. Producers have an interest in meeting these needs, since ignoring them will affect growth and production, which ultimately influence the profits received from the animals.

Addressing Consumer Concerns

With the help of the National Pork Producers Council (NPPC) and state-level associations for pork producers, the swine industry has taken steps to ensure that consumer concerns are addressed. They have developed programs to educate producers to ensure the welfare of pigs, environmental safety, and the quality of pork. Consumers also need to be educated about the measures taken within the industry to deal with these issues.

The swine industry has moved to address the issue of pork production's effect on the environment in several ways. An Environmental Assurance Program has been developed to encourage producers to assess whether they are adequately protecting the environment. The NPPC and state associations have conducted research into reducing odor, protecting ground and surface water, and better using the nutrients from swine wastes. Research has already provided suggestions for modifications to swine diets that can reduce odors and products that can be added to diets or to manure to decrease the amount of odor given off by the waste.

Through programs such as Pork Quality Assurance, producers are exposed to proper production practices to improve management, reduce costs, ensure proper drug usage, and learn about food safety issues. The final stage of Pork Quality Assurance allows producers to develop an HACCP (Hazard Analysis Critical Control Points) program for their individual farms. HACCP is a management tool that identifies potential problems in production practices that might reduce the quality of the pork produced. The producer can then work to eliminate these problems and produce higher quality pork that is more acceptable to consumers.

To help ensure that hogs receive humane care, the NPPC has developed the *Swine Care Handbook* for producers. It contains information on such topics as management practices, proper facilities, environmental management within confinement buildings, nutrition, and health. The industry must continue educating both consumers and producers so no grounds exist for allegations of mistreatment.

Summary

Aspects of pork production, particularly those connected with large-scale confinement hog production, sometimes trouble the American public. Consumers are concerned about pollution of the environment, food safety, animal welfare, and animal rights. With the aid of state and national associations, producers are working to address potential concerns and produce safe, edible pork in a humane and environmentally conscious way.

Credits

Guide to Environmental Quality in Pork Production. Des Moines: National Pork Producers Council, 1993.

Guthier, Harold D., and Janice Swanson. "Animal Rights and Animal Welfare." http://ianrwww.unl.edu/farmbill/aniright.htm (30 May 1997).

National Pork Producers Council. "America's Pork Producers . . . 'Meeting Today's Environmental Challenges.'" http://www.nppc.org/environbook.html (30 May 1997).

National Pork Producers Council. "Most Commonly Asked Questions About Pork Production and the Environment." http://www.nppc.org/EnvironmentalSection/commquestions.html (30 May 1997).

National Pork Producers Council. "The Tradition of Care Continues on America's Hog Farms." http://www.nppc.org/how.hogs.are.raised.html (30 May 1997).

Pork Issues Handbook. Des Moines: National Pork Producers Council, 1996/1997.

Pork Quality Assurance Levels I, II, III. Des Moines: National Pork Producers Council, 1994.

Swine Care Handbook. Des Moines: National Pork Producers Council, 1996.